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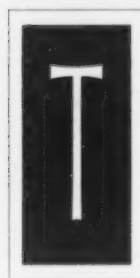
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F O R E W O R D



his year promises to be just as turbulent in oil markets as any in the preceding two decades.

The difference in 1992 is that market pressures are mainly down as most of the world economy remains mired in recession.

After a year that saw war erupt in the Persian Gulf and the Soviet Union collapse, it seems almost unthinkable that 1992 would begin with the prospect of an oil price collapse. But that was the prospect in January 1992 as world markets worried about sagging oil demand caused by the recession and overproduction by the members of the Organization of Petroleum Exporting Countries.

Just a little less than one year after the breathtaking victory by U.S. allied forces in expelling Iraq from occupied Kuwait, crude oil prices seemed headed for the bleak watershed of \$15/bbl again.

As the 1992 *Oil & Gas Journal DataBook* went to press, oil prices had tumbled to about \$17-18/bbl amid frantic warnings within OPEC that production cuts and a return to quotas were needed to stem another oil price collapse, perhaps down to single digits again. Shortly ahead of a scheduled OPEC ministerial meeting in February, several members, notably Venezuela and Saudi Arabia, were talking about the possibility of unilateral production cuts. Those announcements alone put props under oil prices again, at least briefly. But it was clear that OPEC would have to cut production in second quarter 1992 to head off an oil price collapse. Thus the key topic of discussion at the Geneva meeting would be reintroduction of a production ceiling backed by individual national quotas.

Again, as has been the case so many times in the past, it was largely up to Saudi Arabia to provide the key to market stability by leading the way on production curbs. That seemed a likely outcome, given the Saudis' need to sustain revenues in light of massive outlays for the costly Desert Shield and Desert Storm campaigns. The big question remained: How closely would the Saudis bring oil markets to the brink of collapse before they extract concessions from other producers—outside of as well as within OPEC—and retain as much market share as possible?

How did this state of affairs come about? How could world oil markets—only 18 months earlier flirting with \$40/bbl—be teetering on the brink of a price collapse? Especially when two key OPEC Persian Gulf exporters were in war-ravaged shambles and their supplies still a nonfactor. This plus the chaos in the oil sector of the world's biggest producer, what was once the Soviet Union.

What 1991 taught oil markets is a clear lesson: the Saudis hold the key to oil markets in that they can demonstrate an astonishing resiliency in being able to make up for substantial long-term losses of oil supplies from other exporters.

Shortly after Iraq invaded and conquered Kuwait in August 1990, OPEC removed the quotas that had loosely determined production levels in the second half of the 1980s. The Saudis began ramping up production to 8.5 million b/d from 5.4 million b/d, and together with Venezuela, the United Arab Emirates, and other exporters, they offset the loss of 4.3 million b/d of exports from Kuwait and Iraq caused by a global embargo following the invasion.

In January 1991, Operation Desert Storm began massive allied air strikes against Iraqi forces and strategic targets in Iraq. Within 24 hours, crude futures prices registered their biggest one-day drop in history as it quickly became clear that the Iraqis posed no significant threat to the critical oil supplies of Saudi Arabia. Even the start of the ground war portion of Desert Storm scarcely caused a ripple in oil prices. Oil prices plunged to the low to mid-\$20s and remained there through summer 1991.

With the recession crimping demand in 1991, it quickly became apparent that even with the absence of Iraqi and Kuwaiti supplies, other OPEC production increases allowed for a balanced market.

Longer term, the destruction in Kuwait and Iraq posed concerns for oil market observers. Allied air attacks had smashed much of Iraq's oil sector even as Iraqi forces were unleashing unprecedented sabotage actions against Kuwait's oil sector, resulting in history's worst oil fires and worst oil spill.

Initial projections were that Iraqi and Kuwaiti supplies might be off the market for years. But those pessimistic projections were dashed before very long. A monumental effort by multinational wild well control teams had all Kuwaiti wild wells capped by the end of October, about five months ahead of what Kuwaiti officials had projected and at least a year or more ahead of early projections by industry observers. Kuwait was exporting crude again in small volumes at yearend 1991. And Iraq at presstime was still grappling with United Nations terms for resuming oil exports—specifically \$1.6 billion in oil sales to raise funds for humanitarian reasons and begin payments on war reparations. The best projection is that Kuwait would be producing at its preinvasion quota of 1.5 million b/d by yearend 1992, and Iraq would be exporting 540,000–810,000 b/d sometime in late first quarter or early second quarter 1992.

But neither Kuwaiti nor Iraqi oil supplies were a market factor in 1991. Once demand picked up in the second half, went the conventional wisdom, those supplies would be sorely needed. That's because the chaos in the Soviet oil sector was slashing oil production in the world's No. 1 oil producer. The prospect of Soviet oil exports, already down in 1990 to its lowest level in five years, falling still further kept a prop under oil prices in late summer and early fall 1991.

The astounding developments in the U.S.S.R. beginning with the aborted coup in August 1991 and ending in late December 1991 with the disintegration of the U.S.S.R. and its replacement with a loose commonwealth of independent republics was the other key market factor in 1991. It was the prospect of Soviet oil exports disappearing—at a time when OPEC was producing flat out and Iraqi and Kuwaiti supplies were off the market—helped firm prices to \$25–26/bbl in September–October 1991. Again, the conventional wisdom was wrong. While Soviet oil production has continued to fall, domestic consumption also fell in the former Soviet republics as their economies lay in shambles. Consequently, Soviet oil exports have remained fairly stable in a dire need to sustain inflow of hard currency to the republics.

Coupled with depressed demand and relatively warm winter weather in late 1991, the market situation quickly turned to one of gloom in early 1992.

World demand for crude oil in 1992 was expected to grow by only 600,000 b/d to

66.8 million b/d, according to the International Energy Agency in its first oil market report of 1992.

Demand among members of the Organisation for Economic Cooperation and Development (OECD) is expected to rise by 400,000 b/d, with the remainder of the increase coming from the rest of the world.

Non-OECD growth has been depressed by consumption declines in the former Soviet Union and non-OECD European countries—notably the former Soviet satellites, also contending with economic woes.

When these are removed, traditional non-OECD growth is expected to be 800,000 b/d in 1992, double the projected rate of increase in the main industrial countries.

During 1992, growth is expected in all the OECD areas but with North America taking a larger share than Europe and Japan, reversing the trends seen the past two years.

This partly reflects gross domestic product projections that show economic activity picking up in North America but slowing in Japan and Germany. North American oil demand is projected to rise by 400,000 b/d, or about 2%, to 18.9 million b/d—the same level as in 1990 but 400,000 b/d below 1989.

European oil demand is expected to increase by 100,000 b/d to 13.3 million b/d, less than 1%, and OECD Pacific region demand is expected to increase by 1.5% to 6.2 million b/d.

In the non-OECD area, demand in the former Soviet Union is expected to fall by 600,000 b/d, or 7%, to 7.7 million b/d. In non-OECD Europe, the decline is projected at 100,000 b/d to 1.3 million b/d.

The biggest increases in non-OECD demand are expected in Asia followed by Latin America.

IEA's January 1992 oil report also showed crude throughput in refineries in the OECD's European members increased by 1.2 million b/d to 12 million b/d in November, reversing declines seen the previous two months.

Japanese refineries also saw an increase of about 400,000 b/d to 4.1 million b/d, while U.S. crude throughput was unchanged at 12.9 million b/d.

Preliminary indications for December 1991 suggested sustained throughput in European countries at relatively high levels coinciding with firm refining markets, IEA said. Japanese throughput was thought to have increased slightly from November levels, and U.S. weekly throughput data indicated slightly higher crude runs in December.

With the outlook for crude prices in 1992 moderate at best and a slightly recovering demand nudging products prices up, refining margins are likely to be fairly healthy, if not spectacular for the year. A litmus test of that will be the effect on U.S. markets when the first critical provisions of the 1990 Clean Air Act kick in during November 1992. That involves increased oxygen levels in gasoline to cut autos' carbon monoxide emissions in the nine worst air quality nonattainment urban areas as much as four months of the year. To accommodate that higher oxygen level, U.S. refiners will have to scramble to line up supplies of oxygenates that are already projected to be in short supply. A shortage of oxygenates could spell regional product shortfalls and price spikes. Whether there is a public outcry when that happens may well determine just how much of the added cost of oxygenates

refiners can recover and how attractive their margins will be. How high prices go also will be a factor in whether oil demand jumps as expected in second half 1992.

One prediction that's fairly safe: 1992 will be another grim year for the U.S. gas industry. Spot gas prices fell to record lows in 1991, and the absence of protracted cold snap in early winter 1991-92 yielded little short term relief, as spot gas prices in January plunged about 40 ¢/Mcf below expectations.

The petroleum industry in the United States was shrouded in gloom in early 1992. The continuing economic malaise offered little prospect of a significant pickup in oil demand anytime soon, and OPEC disarray threatened another oil price slide. A number of factors, including low cost Canadian gas imports and subsidized coal seam and tight sands gas, left beleaguered U.S. gas producers with little choice but to sell gas at uneconomic prices or shut in gas and lose all revenues.

The overwhelmingly hostile business climate in the United States toward the oil industry—culminating in the partisan political defeat of a comprehensive energy bill in the Senate in late 1991 (and with it any near-term chance of leasing the highly prospective Coastal Plain of the Arctic National Wildlife Refuge)—led many companies to press restructuring measures in late 1991 and early 1992, leading to another round of budget cuts, layoffs, reduced profits, mergers and acquisitions, and capital flight to friendlier, foreign climates.

That trend underscores a large trend that adds a third catchphrase to oil companies' lexicon for the 1990s. Along with "Decade of the Environment" and "OPEC's role in market stability," industry must contend with the increasing "globalization of the petroleum industry." Economic and political barriers are falling with breathtaking speed across the world. Privatization measures abound in Latin America. Companies are scrambling to cut deals with the remnants of fallen totalitarian regimes. The new economic powerhouses of the Asia Pacific region feature soaring oil demand and major investment opportunities, especially in refining and petrochemicals.

Until—or if ever—the United States develops a sane, comprehensive energy strategy that does not penalize exploration, drilling-production, and downstream operations, there are much better opportunities for many companies—notably majors and big independents—outside the United States. Conversely, their departure and rationalization of U.S. operations leaves new opportunities for the companies that remain behind, notably smart, flexible, small and midsize independents that can learn from the lessons in market gyrations of years past.

The information in this year's *OGJ DataBook* provides a mirror for the turbulent year of 1991 and a comparison with the years that preceded it. Odds are that 1992 will prove turbulent as well, and the facts and statistics that paint a portrait of 1991 in the *DataBook* also will provide a guide for the year to come.

Bob Williams
Associate Managing Editor-News
Oil & Gas Journal



OGJ300: Smaller list, bigger financial totals

Robert J. Beck
Economics Editor

Joan Bonfield Biggs
Statistics Editor

Oil & Gas Journal's list of the largest, publicly traded oil and gas producing companies in the U.S. is both smaller and larger this year than it was in 1990.

It's smaller because it covers fewer companies. Industry consolidation has slashed the number of public companies.

As a result, the former OGJ400 has become the OGJ300, which includes the 30 largest limited partnerships.

But the assets-ranked list is larger because important financial totals—representing 1990 results—are significantly higher than those of a year

ago, despite the lower number of companies.

Consolidation of the U.S. producing industry gained momentum throughout the 1980s. Unable to sustain profitability in a period of sluggish energy prices and, for many, rising costs, companies sought relief through mergers or liquidation of producing properties.

As this year's list shows, however, surviving companies have managed to grow.

Assets for the OGJ300 group totaled \$499.3 billion in 1990—up 6.3% from the 1989 total of last year's OGJ 400. Stockholders' equity moved up 5.3% to \$170.7 billion. Stockholders' equity was as high as \$233.8 billion in 1983.

Total 1990 net income for this year's group was \$23.2 billion in 1990, up 14.2% from

last year's OGJ400 group, which reflected 1989 profits down 8.6% from the previous year. The recent low point in profits: 1986 at \$5.2 billion.

Several other measures of group financial performance showed improvement in 1990 despite the smaller number of companies.

Capital and exploration spending moved up along with net income. Outlays in 1990 totaled \$56.2 billion—up 14.3% from last year's OGJ400 outlays of 1989. Net wells drilled in the U.S. by this year's group gained 28.5% to 10,870.

Part of the increase in earnings resulted from an increase in total revenues. Group revenues in 1990 totaled \$536.5 billion, an increase of 16.8% from last year's OGJ400 total for 1989. Sharply higher crude oil and

Some key changes from 1990 OGJ400

How company appeared on last year's list	Why change?	How company appears on this year's list
Beruch-Foster Corp.	Merged with.....	Hedson Corp.
Bolyard Oil & Gas Ltd.	Name changed to.....	Camelot Corp.
Convest Energy Partners Ltd.	Name changed to.....	Convest Energy Corp.
Dallas Oil & Minerals Inc.	Acquired by.....	Lomak Petroleum
Diversified Energies Inc.	Merged with.....	Arida Inc.
Eglinton Oil & Gas Corp.	Operations now reported under.....	Osceola Oil & Gas
Hershey Oil Corp.	Acquired by.....	American Exploration Co.
KRM Petroleum Corp.	Name changed to.....	PrimeEnergy Corp.
Monogram Oil & Gas Inc.	Acquired by.....	Lomak Petroleum
Parker & Parsley Development Partners LP	Name changed to.....	Parker & Parsley Petroleum Co.
Pauley Petroleum Inc.	Named changed to.....	Hondo Oil & Gas Co.
Petroleum Investments Ltd.	Acquired by.....	Bradmar Petroleum Corp.
Plano Petroleum Corp.	Name changed to.....	Search Exploration Inc.
Premier Resources Ltd.	Acquired by.....	Oxford Consolidated
Snyder Oil Partners LP	Acquired by, then became public.....	Snyder Oil Corp.
Thermal Exploration	Name changed to.....	Washington Energy Resources Co.
ZG Energy Corp.	Merged with private co. and formed.....	Vantage Point Energy

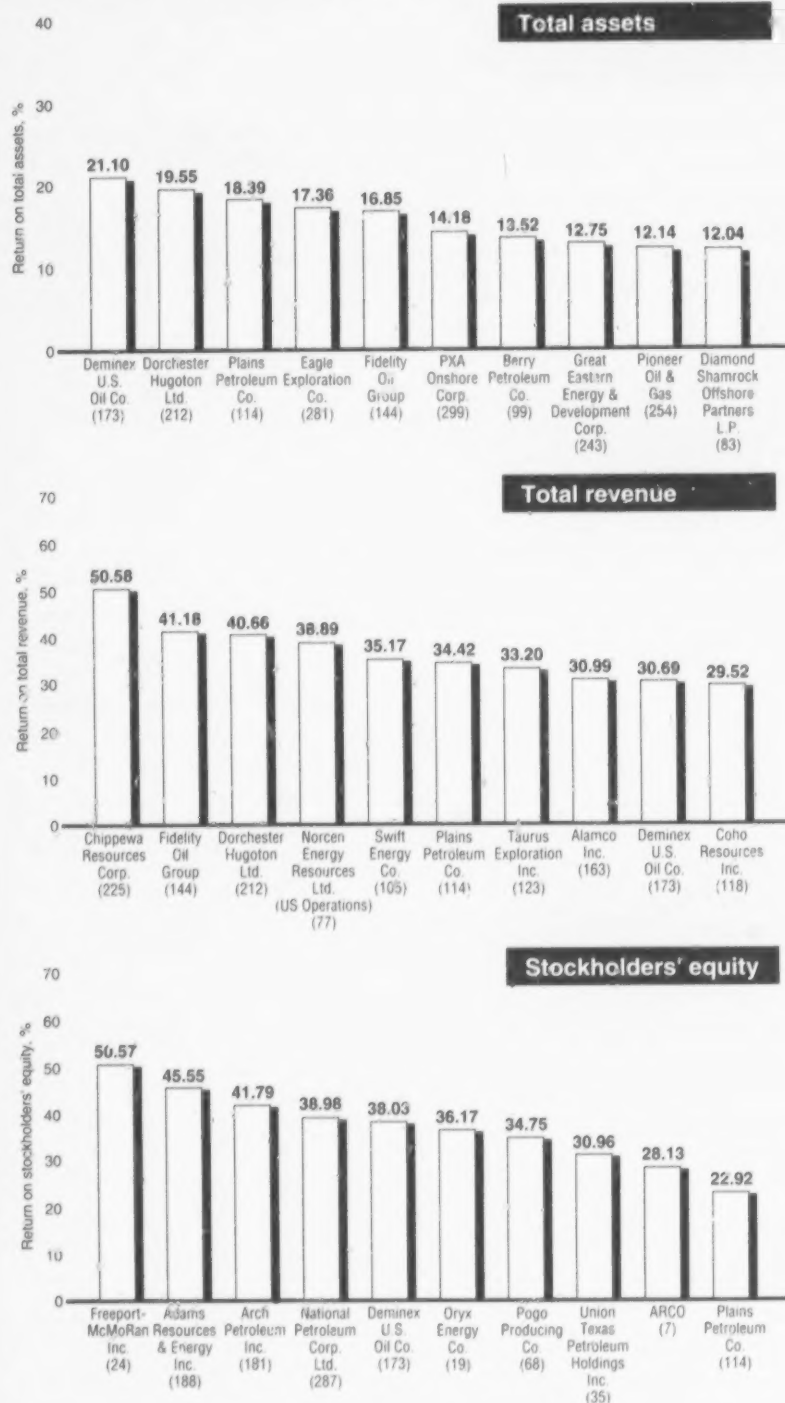
The following companies sold their U.S. oil and gas properties, liquidated, or became private during the past year:

Bogart Oil
Bridge Oil
Herkon Energy Corp.

Houston Oil Royalty Trust
Mustang Co. Inc.
North Star Petroleum Inc.

Republic Waste Industries Inc.
Sunshine Mining Co.
Unimer Co.

Top companies in return on . . *



*Includes subsidiary companies, whose accounting methods vary and who may be helped by contributions from parent companies. Excludes companies whose results were inflated by identifiable extraordinary gains. Excludes royalty trusts. Excludes companies who get only a small portion of their revenue from oil and gas. Numbers in parenthesis are rank by total assets.

petroleum product prices during the latter part of the year, due to the conflict in the Persian Gulf, were the main reason for the increased revenues.

1990 prices up

Earnings from U.S. and worldwide exploration and production activities were up in 1990 for many of the companies, reflecting the sharp rise in crude oil prices. Increased natural gas production in the U.S. and worldwide also helped boost earnings in this segment. However, lower crude oil production in the U.S. offset some of the improvement.

The average wellhead price of crude oil in the U.S. moved up 26.3% in 1990 to \$20.03/bbl. The average wellhead price of natural gas increased 1.8% to \$1.72/Mcf. U.S. gas production rose 2.4% to 18.469 tcf. U.S. crude oil production was down 3.4% to 7.355 million b/d.

Earnings from downstream operations were squeezed in 1990, particularly later in the year, when refinery feedstock costs moved up faster than product prices.

This was especially true for U.S. operations. The U.S. refiner acquisition cost of crude oil moved up 23.7% in 1990 to an average \$22.23/bbl. By comparison, the average pump price for all types of motor gasoline increased 14.8% to \$1.217/gal. The average price of No. 2 distillate for home heating increased 18% to an average \$1.062/gal for 1990.

Downstream earnings in the U.S. were also hurt by a 2% reduction in petroleum product demand to 16.988 million b/d. Petroleum product demand outside the U.S. moved up in 1990, increasing 200,000 b/d to 48.8 million b/d.

Capital spending

Capital and exploration spending has increased in line with an overall improvement in earnings the past 3 years.

During 1988-90, net income for the OGJ400 and OGJ300 groups averaged \$21.9 billion/year. That com-

Fastest growing companies*

Rank by total assets	Company	Stockholders' equity			Net income			Long-term debt		
		1990 (\$1,000)	1989 %	change	1990 (\$1,000)	1989 %	change	1990 (\$1,000)	1989	
204	Lomax Petroleum, Inc.	6,463	1,044	516.1	285	103	176.7	4,216	4,307	
131	Kelley Oil Corp.	26,448	8,778	201.3	2,332	306	982.1	7,859	3,994	
91	Energy Ventures Inc.	76,631	26,455	189.7	31,621	2,651	1,009.1	7,645	9,291	
106	Castle Energy Corp.	46,626	16,137	188.9	2,575	1,245	106.8	17	6,487	
139	Barrett Resources Corp.	40,412	17,625	129.3	1,421	1,112	31.7	0	83	
210	Southern Mineral Corp.	9,494	4,460	112.9	5,499	932	493.3	0	0	
97	Heddon Energy Resources Corp.	73,878	35,185	109.4	6,692	539	1,141.6	30,514	51,096	
70	Seagull Energy Corp.	192,516	101,025	90.8	20,569	9,839	107.0	49,239	118,829	
299	PXA Onshore Corp.	129	69	87.0	20	2	900.0	0	9	
84	American Exploration Co.	91,937	50,651	81.5	4,049	2,455	64.9	42,648	11,875	
94	Howell Corp.	82,572	32,206	63.2	22,959	8,243	178.5	25,193	43,189	
24	Freight-McMoran Inc.	620,110	390,972	68.6	313,580	149,855	109.3	1,578,900	1,712,600	
201	Tide West Oil Co.	4,331	2,764	56.7	1,559	705	121.1	2,000	2,005	
157	New London Inc.	25,855	17,347	47.9	1,247	513	143.1	6,657	9,222	
114	Plains Petroleum Co.	73,280	50,386	45.4	15,796	15,087	4.4	3,000	0	
229	Quessa Oil & Gas Co.	2,703	1,952	38.5	788	500	57.6	200	343	
266	Texas Vanguard Oil Co.	1,156	840	37.6	315	115	173.9	0	0	
202	Whiting Petroleum Corp.	11,221	6,160	37.5	3,008	1,668	80.3	0	0	
87	Nucorp Inc.	45,870	34,971	31.2	5,273	725	827.3	53,352	0	
224	Panfil Petroleum Corp.	4,340	3,346	29.0	1,009	43	2,246.5	2,202	814	

* Companies were selected on the basis of growth in stockholders' equity. Only companies with positive net income for both 1989 and 1990 were considered. Companies were not considered if they had a decline in net income for 1990, were subsidiaries of another company, or became public within the last year.

pared with \$9.4 billion in 1987 and the \$5.2 billion of 1986.

When OGJ400 earnings jumped to \$22.3 billion in 1988, capital and exploration spending increased 20.3% to \$50.1 billion. The spending total dipped to \$49.2 billion in 1989, when earnings slipped to \$20.3 billion, before last year's strong recovery for the OGJ300 group.

OGJ400 group spending had been as high as \$66.5 billion in 1983, when net income totaled \$28 billion. Group capital outlays exceeded \$65 billion/year throughout 1982-85.

U.S. drilling activity hasn't kept up with earnings growth since 1986. During that year, with its low OGJ400 group profits, group net wells drilled totaled 10,993.

Last year, when profits for the OGJ300 group totaled 329% more than for the OGJ400 group total in 1986, there were 123 fewer net U.S. wells drilled.

The U.S. average active rig count set record lows of 964 in 1986, 936 in 1987, and 869 in 1989.

Last year the rig count averaged 1,010.

Price volatility

Volatile crude oil prices and low gas prices are helping to suppress U.S. drilling. The average wellhead price of U.S. crude oil fell from \$24.09/bbl in 1985 to \$12.51/bbl in 1986, when key

members of the Organization of Petroleum Exporting Countries flooded the market with oil.

Excess production capacity in OPEC helped keep prices low during the next several years. U.S. wellhead prices moved up to \$15.40/bbl in 1987, fell to \$12.58/bbl in 1988, and moved back up to \$15.86/bbl in 1989. Last year conflict in the Persian Gulf boosted crude oil prices to an average of \$20.03/bbl.

Natural gas prices have followed oil prices down. The U.S. average wellhead price for gas fell from \$2.51/Mcf in 1985 to \$1.67/Mcf in 1987. The price has moved up only marginally since then, to

\$1.69/Mcf in 1988 and 1989 and \$1.72/Mcf in 1990.

Generally depressed crude oil prices also have restrained drilling outside the U.S. but not as much. The number of active drilling rigs outside the U.S. and Canada averaged 1,289 in 1985 and fell to 1,079 in 1986 following the price collapse. The average slipped to 981 in 1987, rebounded to 1,023 in 1988, and fell again to 922 in 1989 and 907 last year.

There was some optimism that drilling activity would improve again this year in the U.S. and elsewhere. The war in the Persian Gulf temporarily removed some of the excess worldwide crude oil production capacity from world

markets. This was expected to help stabilize crude prices at levels higher than in recent years, renewing interest in exploration and production investments.

World crude oil prices dipped immediately following the conflict but have remained relatively stable since February. And prices have remained somewhat higher than in recent years. However drilling activity, particularly in the U.S., has not responded.

The U.S. rig count through the first 8 months of 1991 has averaged only 920 rigs, down from 963 rigs last year. The weakness in the U.S. has been attributed mainly to low natural gas prices.

Outside the U.S. and Canada, the count during the first 7 months of 1991 has averaged 900, down from 926 in the same period a year earlier.

There is still some optimism in the industry due to expectations of increasing demand for petroleum products and natural gas. Companies continue to reorganize and restructure, cutting costs and improving operating efficiencies, positioning themselves to take advantage of opportunities and turn them into profits.

How future investment money is spent depends upon whether the profits are seen coming from upstream or downstream operations.

The top 20 in total revenue

Rank	Company	Total revenue, \$ million
1	Exxon Corp.	116,940.0
2	Mobil Corp.	64,472.0
3	Chevron Corp.	42,566.0
4	Texasco Inc.	41,822.0
5	Amoco Corp.	31,581.0
6	Shell Oil Co.	24,790.0
7	Occidental Petroleum Corp.	22,060.0
8	ARCO	19,898.0
9	BP (USA)	18,620.0
10	Conoco Inc.	15,978.0
11	Phillips Petroleum Co.	13,975.0
12	USX-Marathon Group	13,535.0
13	Enron Corp.	13,197.7
14	Unocal Corp.	11,808.0
15	Coastal Corp.	9,490.4
16	Ashland Oil Inc.	9,100.0
17	Amerada Hess Corp.	7,081.1
18	American Petrofina Inc.	3,979.0
19	Kerr-McGee Corp.	3,701.0
20	Transco Energy Co.	3,112.1
Total		487,702.3

The top 20 in net income and stockholders' equity

Rank	Company	Net income, \$ million
1	Exxon Corp.	5,010.0
2	BP (USA)	2,631.0
3	Chevron Corp.	2,157.0
4	ARCO	2,011.0
5	Mobil Corp.	1,929.0
6	Amoco Corp.	1,913.0
7	Texaco Inc.	1,450.0
8	Conoco Inc.	1,078.0
9	Shell Oil Co.	1,036.0
10	Phillips Petroleum Co.	779.0
11	USX-Marathon Group	508.0
12	Amerada Hess Corp.	482.7
13	Unocal Corp.	401.0
14	Freeport-McMoRan Inc.	313.6
15	Union Pacific Resources Co.	240.0
16	Coastal Corp.	225.6
17	Oryx Energy Co.	225.0
18	Enron Corp.	202.2
19	Meridian Oil Inc.	190.0
20	Ashland Oil Inc.	182.1
Total		22,964.2

Rank	Company	Stockholders' equity, \$ million
1	Exxon Corp.	33,055.0
2	Mobil Corp.	17,072.0
3	Shell Oil Co.	16,335.0
4	Chevron Corp.	14,836.0
5	Amoco Corp.	14,068.0
6	Texaco Inc.	9,366.0
7	ARCO	7,149.0
8	Occidental Petroleum Corp.	4,112.0
9	USX-Marathon Group	3,625.0
10	Amerada Hess Corp.	3,106.0
11	Phillips Petroleum Co.	2,719.0
12	Unocal Corp.	2,550.0
13	Meridian Oil Inc.	2,520.1
14	Coastal Corp.	1,981.0
15	Enron Corp.	1,856.2
16	Consolidated Natural Gas Co.	1,844.6
17	Columbia Gas System Inc.	1,757.8
18	Kerr-McGee Corp.	1,491.0
19	Arida Inc.	1,265.4
20	Ashland Oil Inc.	1,260.0
Total		142,928.1

Financial results

Of the 300 companies on this year's list, 208 reported profits for 1990.

With higher total net income, some of the indicators of financial performance showed improvement for the year.

Return on assets for the group moved up to 4.7% from 4.3% the year before. Return on assets had slumped to only 1% in 1986. The best year was 1982 at 5.7%.

Total return on revenue slipped to 4.3% in 1990 from 4.4% in 1989. The highest return on revenue posted for the group was 5.1% in 1988. The lowest return on revenue was 1.2% in 1986.

Return on stockholders' equity also moved up, increasing to 13.6% from 12.6% in 1989. The high for this measure of performance

was 13.8% in 1982 and the low was 3% in 1986.

The OGJ400/300 group of companies has constantly been changing since the first report for fiscal 1982, so year to year comparisons are not for identical groups. However, the group does represent a large portion of the domestic oil and gas industry and therefore reflects changes and trends in industry activity and operating performance.

Operating performance

Worldwide liquids production of the OGJ300 fell 10.2% in 1990 to 3.092 billion bbl. Worldwide production fell 6% in 1989.

U.S. liquids production of the group fell 5.4% to 2.029 billion bbl. This is the fifth consecutive year that group worldwide and U.S. liquids

production totals have fallen.

The group's gas production moved up in 1990. Worldwide production was up 0.7% to 14.1 tcf. U.S. gas output increased 2.8% to 10.6 tcf. Group worldwide production has been moving up since 1985.

Total liquids reserves fell. Worldwide reserves were down 8% to 31.9 billion bbl at yearend 1990. U.S. liquids reserves fell 2.4% to 21.9 billion bbl.

Worldwide natural gas reserves of the OGJ300 fell in 1990, while U.S. gas reserves moved up. Worldwide natural gas reserves totaled 165.1 tcf, down 0.6%. U.S. reserves moved up 3.6% to 113.8 tcf.

Group changes

This year's OGJ300 group contains 26 companies that

were not on last year's list.

There are 27 companies that are subsidiaries of non-U.S. energy companies or of companies operating in another industry.

The 30 limited partnerships on this year's list compares with 95 last year, 71 in 1989, and 63 in 1988. Under OGJ300 selection criteria, corporations are added to the list before partnerships.

Publicly held limited partnerships were first included in the OGJ400 in the 1988 report.

The number of limited partnerships may decline further in future years. Some investment firms that formed public oil and gas partnerships in recent years plan to consolidate assets into larger but fewer entities.

The largest limited partnership on the list, in terms of

The top 20 in spending and U.S. net wells drilled

Rank	Company	Capital, exploratory spending, \$ million
1	Exxon Corp.	7,505.0
2	Mobil Corp.	4,374.0
3	Chevron Corp.	3,878.0
4	Amoco Corp.	3,714.0
5	Shell Oil Co.	2,805.0
6	Texaco Inc.	2,781.0
7	ARCO	2,718.0
8	Conoco Inc.	1,925.0
9	Oryx Energy Co.	1,880.0
10	Amerada Hess Corp.	1,737.6
11	BP (USA)	1,614.0
12	Occidental Petroleum Corp.	1,576.0
13	Phillips Petroleum Co.	1,383.0
14	Unocal Corp.	1,316.0
15	USX-Marathon Group	1,299.0
16	Meridian Oil Inc.	883.1
17	Transco Energy Co.	706.0
18	Enron Corp.	698.1
19	Freeport-McMoRan Inc.	609.9
20	Columbia Gas System Inc.	600.1
Total		43,952.8

Rank	Company	U.S. net wells drilled
1	Shell Oil Co.	762.0
2	Texaco Inc.	755.0
3	Amoco Corp.	699.0
4	Mobil Corp.	630.0
5	Chevron Corp.	618.0
6	ARCO	481.0
7	Meridian Oil Inc.	466.7
8	USX-Marathon Group	359.0
9	Exxon Corp.	325.0
10	Union Pacific Resources Co.	296.0
11	Unocal Corp.	274.0
12	Occidental Petroleum Corp.	261.4
13	Conoco Inc.	257.4
14	Equitable Resources Inc.	235.0
15	Phillips Petroleum Co.	222.0
16	Columbia Gas System Inc.	203.0
17	Oryx Energy Co.	193.0
18	Santa Fe Energy Resources Inc.	186.0
19	Pennzoil Co.	165.2
20	Enron Corp.	146.7
Total		7,316.4

The top 20 in liquids reserves

Rank	Company	U.S. liquids reserves, million bbl
1	Shell Oil Co.	2,823.0
2	ARCO	2,720.0
3	BP (USA)	2,473.0
4	Exxon Corp.	2,437.0
5	Chevron Corp.	1,653.0
6	Texaco Inc.	1,600.0
7	Amoco Corp.	1,559.0
8	Mobil Corp.	1,207.0
9	USX-Marathon Group	572.0
10	Unocal Corp.	561.0
11	Oryx Energy Co.	523.0
12	Phillips Petroleum Co.	507.0
13	Conoco Inc.	475.0
14	Santa Fe Energy Resources Inc.	222.3
15	Amerada Hess Corp.	197.0
16	Occidental Petroleum Corp.	197.0
17	Pennzoil Co.	153.0
18	Union Pacific Resources Co.	153.0
19	Mitchell Energy & Development Corp.	120.2
20	Meridian Oil Inc.	109.6
Total		20,262.1

Rank	Company	Worldwide liquids reserves, million bbl
1	Exxon Corp.	6,331.0
2	Shell Oil Co.	3,061.0
3	ARCO	2,930.0
4	Chevron Corp.	2,794.0
5	Mobil Corp.	2,664.0
6	Amoco Corp.	2,660.0
7	Texaco Inc.	2,351.0
8	Phillips Petroleum Co.	1,114.0
9	Conoco Inc.	1,045.0
10	USX-Marathon Group	846.0
11	Unocal Corp.	823.0
12	Oryx Energy Co.	768.0
13	Occidental Petroleum Corp.	752.0
14	Amerada Hess Corp.	611.0
15	Santa Fe Energy Resources Inc.	222.3
16	Maxus Energy Corp.	171.0
17	Pennzoil Co.	156.0
18	Union Pacific Resources Co.	153.0
19	Kerr-McGee Corp.	136.3
20	Union Texas Petroleum Holdings Inc.	134.1
Total		29,722.7

The top 20 in liquids production

Rank	Company	U.S. liquids production, million bbl
1	BP (USA)	269.0
2	Exxon Corp.	234.0
3	ARCO	233.0
4	Shell Oil Co.	168.0
5	Chevron Corp.	167.0
6	Texaco Inc.	167.0
7	Amoco Corp.	127.0
8	Mobil Corp.	102.0
9	Unocal Corp.	52.0
10	Oryx Energy Co.	51.0
11	Phillips Petroleum Co.	49.0
12	USX-Marathon Group	46.0
13	Conoco Inc.	44.0
14	Amerada Hess Corp.	26.0
15	Occidental Petroleum Corp.	24.0
16	Union Pacific Resources Co.	22.9
17	Santa Fe Energy Resources Inc.	19.0
18	Mitchell Energy & Development Corp.	16.6
19	Meridian Oil Inc.	15.2
20	Pennzoil Co.	11.0
Total		1,842.7

Rank	Company	Worldwide liquids production, million bbl
1	Exxon Corp.	584.0
2	Chevron Corp.	306.0
3	Amoco Corp.	281.0
4	Texaco Inc.	261.0
5	ARCO	257.0
6	Mobil Corp.	243.0
7	Shell Oil Co.	197.0
8	Conoco Inc.	131.0
9	Phillips Petroleum Co.	98.0
10	Unocal Corp.	87.0
11	Occidental Petroleum Corp.	80.0
12	Oryx Energy Co.	77.0
13	USX-Marathon Group	71.9
14	Amerada Hess Corp.	63.0
15	Union Pacific Resources Co.	22.9
16	Maxus Energy Corp.	19.6
17	Santa Fe Energy Resources Inc.	19.0
18	Kerr-McGee Corp.	18.4
19	Mitchell Energy & Development Corp.	15.6
20	Ashland Oil Inc.	15.3
Total		2,847.7

The top 20 in gas reserves

Rank	Company	U.S. gas reserves, bcf
1	Amoco Corp.	12,480.0
2	Exxon Corp.	9,542.0
3	Mobil Corp.	7,149.0
4	Chevron Corp.	7,086.0
5	Shell Oil Co.	6,398.0
6	ARCO	6,256.0
7	Texaco Inc.	4,849.0
8	Meridian Oil Inc.	4,703.0
9	Unocal Corp.	4,260.0
10	Phillips Petroleum Co.	3,806.0
11	BP (USA)	3,040.0
12	USX Corp. (USX-Marathon Group)	2,391.0
13	Occidental Petroleum Corp.	2,335.0
14	Conoco Inc.	2,299.0
15	Mesa LP	1,971.3
16	Oryx Energy Co.	1,885.0
17	Union Pacific Resources Co.	1,694.4
18	Anadarko Petroleum Corp.	1,650.3
19	Enron Corp.	1,343.5
20	Enserch Corp.	1,224.1
Total		86,362.6

Rank	Company	Worldwide gas reserves, bcf
1	Exxon Corp.	24,924.0
2	Mobil Corp.	19,143.0
3	Amoco Corp.	19,023.0
4	Chevron Corp.	9,301.0
5	ARCO	8,052.0
6	Shell Oil Co.	6,795.0
7	Unocal Corp.	6,574.0
8	Texaco Inc.	5,998.0
9	Phillips Petroleum Co.	5,663.0
10	Meridian Oil Inc.	4,703.0
11	USX-Marathon Group	4,462.0
12	Conoco Inc.	3,850.0
13	Amerada Hess Corp.	2,683.0
14	Occidental Petroleum Corp.	2,556.0
15	Oryx Energy Co.	2,031.0
16	Mesa LP	1,971.3
17	Anadarko Petroleum Corp.	1,704.3
18	Union Pacific Resources Co.	1,694.4
19	Union Texas Petroleum Holdings Inc.	1,488.1
20	Enron Corp.	1,475.0
Total		134,091.1

assets, is Mesa—No. 32 with assets of \$2.2 billion. The smallest LP is Columbian Energy Co. LP, No. 220 with assets of \$8.7 million.

The list has five royalty trusts, compared with six last year and seven the year before.

Mergers and consolida-

tions and other changes in reserves ownership continued throughout 1990 (see table).

To be included in this

year's OGI300 list required assets of \$71,000, down sharply from \$455,000 last year. This is the lowest cutoff point since the OGI400/300

The top 20 in gas production

Rank	Company	U.S. gas production, bcf
1	Chevron Corp.	867.0
2	Texaco Inc.	741.0
3	Exxon Corp.	724.0
4	Amoco Corp.	707.0
5	Mobil Corp.	600.0
6	ARCO	537.0
7	Shell Oil Co.	517.0
8	Unocal Corp.	324.0
9	Phillips Petroleum Co.	319.0
10	USX-Marathon Group	288.3
11	Oryx Energy Co.	281.0
12	Conoco Inc.	237.0
13	Occidental Petroleum Corp.	234.0
14	Meridian Oil Inc.	228.5
15	Union Pacific Resources Co.	202.6
16	Amerada Hess Corp.	167.0
17	BP (USA)	165.0
18	Enron Corp.	164.5
19	Anadarko Petroleum Corp.	148.2
20	Consolidated Natural Gas Co.	147.0
Total		7,706.1

Rank	Company	World gas production, bcf
1	Mobil Corp.	1,810.0
2	Exxon Corp.	1,377.0
3	Amoco Corp.	1,285.0
4	Chevron Corp.	1,107.0
5	Texaco Inc.	817.0
6	ARCO	636.0
7	Shell Oil Co.	586.0
8	Unocal Corp.	521.0
9	Phillips Petroleum Co.	465.0
10	USX-Marathon Group	423.8
11	Conoco Inc.	374.0
12	Oryx Energy Co.	281.0
13	Occidental Petroleum Corp.	258.0
14	Amerada Hess Corp.	257.0
15	Meridian Oil Inc.	228.5
16	Union Pacific Resources Co.	202.6
17	Union Texas Petroleum Holdings Inc.	178.0
18	Enron Corp.	171.1
19	Anadarko Petroleum Corp.	160.3
20	Consolidated Natural Gas Co.	147.0
Total		11,066.3

was started.

Consolidations, acquisitions, mergers, and liquidations all contributed to the reduction in the number of companies and the lowering of the asset cutoff. Exclusion of some limited partnerships because of the priority for corporations in the selection criteria also contributed to the lowering of the asset requirements.

This cutoff asset number has fluctuated from a previous low of \$149,000 in 1986 to a high of \$2.366 billion in 1983.

The asset value cutoff for the top 100 companies increased to \$128.5 million this year from \$94.7 million last year.

The number of companies posting net income exceeding \$100 million in 1990 moved up to 30 from 28 in 1989 and 1988 and 21 in 1987. A total of 90 companies reported net losses for 1990, one reported neither income nor loss, and one didn't report earnings.

Five companies lost \$100 million or more. Last year none of the companies lost more than \$100 million.

One company on this year's list, Occidental Petroleum, posted a loss of \$1.7 billion in 1990.

Top 20

There is one new company in the top 20 this year. Oryx Energy moved up to No. 19 from 21 last year. Consolidated Natural Gas fell to No. 22 from 19.

Some companies changed positions within the top 20 this year; however, no other company in the top 20 moved more than one position up or down.

The 20 largest companies had total assets of \$408.9 billion in 1990, compared with \$390.3 billion a year ago.

This represents 81.9% of the total assets of the OGJ300. Last year's top 20 assets total was 83.1% of the entire OGJ400 list.

This year's top 20 reported 1990 revenues of \$483.8 billion, 90.2% of the OGJ300 total. Their net income was \$20.7 billion, 89.2% of the total. And their stockholders' equity totaled \$136.8 billion, 80.1% of the entire OGJ300.

Capital and exploration expenditures by the top 20 group in 1990 amounted to \$43.1 billion, 76.7% of OGJ300 spending. The group drilled 6,475 net U.S. wells in 1990, 59.6% of all U.S. wells drilled by the OGJ300.

The top 20 accounted for 89.7% of the OGJ300's worldwide liquids production, 87.7% of U.S. liquids production, 74.4% of worldwide gas production, and 68.8% of U.S. gas production.

The 20 biggest firms held 91.1% of the OGJ300's worldwide liquids reserves and 90% of U.S. liquids reserves.

They also had 76.2% of the worldwide gas reserves and 70.7% of U.S. gas reserves.

OGJ300 shares

The OGJ300 group's total revenue of \$536.5 billion in 1990 was 9.8% of U.S. gross national product (GNP). This compares with 8.8% of GNP the year before. The group's revenues were as much as 18.4% of GNP in 1983.

The OGJ300 companies also posted a substantial share of total U.S. oil and gas production and reserves in 1990. Their liquids production was 61.8% of the U.S. total, and natural gas production was 57.5% of the U.S. total. They had 64.5% of total U.S. liquids reserves and 68.5% of U.S. gas reserves.

On a worldwide basis, OGJ300 shares of reserves and production totals aren't as impressive because OPEC countries and national oil companies control so much outside the U.S. The group held 2.7% of worldwide liquids reserves and 3.9% of natural gas reserves. In 1990, the group's production shares were 13.1% for worldwide liquids and 18.7% for worldwide natural gas.

In the future these percentages may move up. New production sharing opportunities for private companies have been developing in the U.S.S.R., East Europe, Latin America, and Africa. The need for investment capital is the major reason behind the changing terms and conditions in these areas. Some OPEC countries may also be moderating their former opposition to outside invest-

ment as they search for capital to finance production projects.

Fast growers

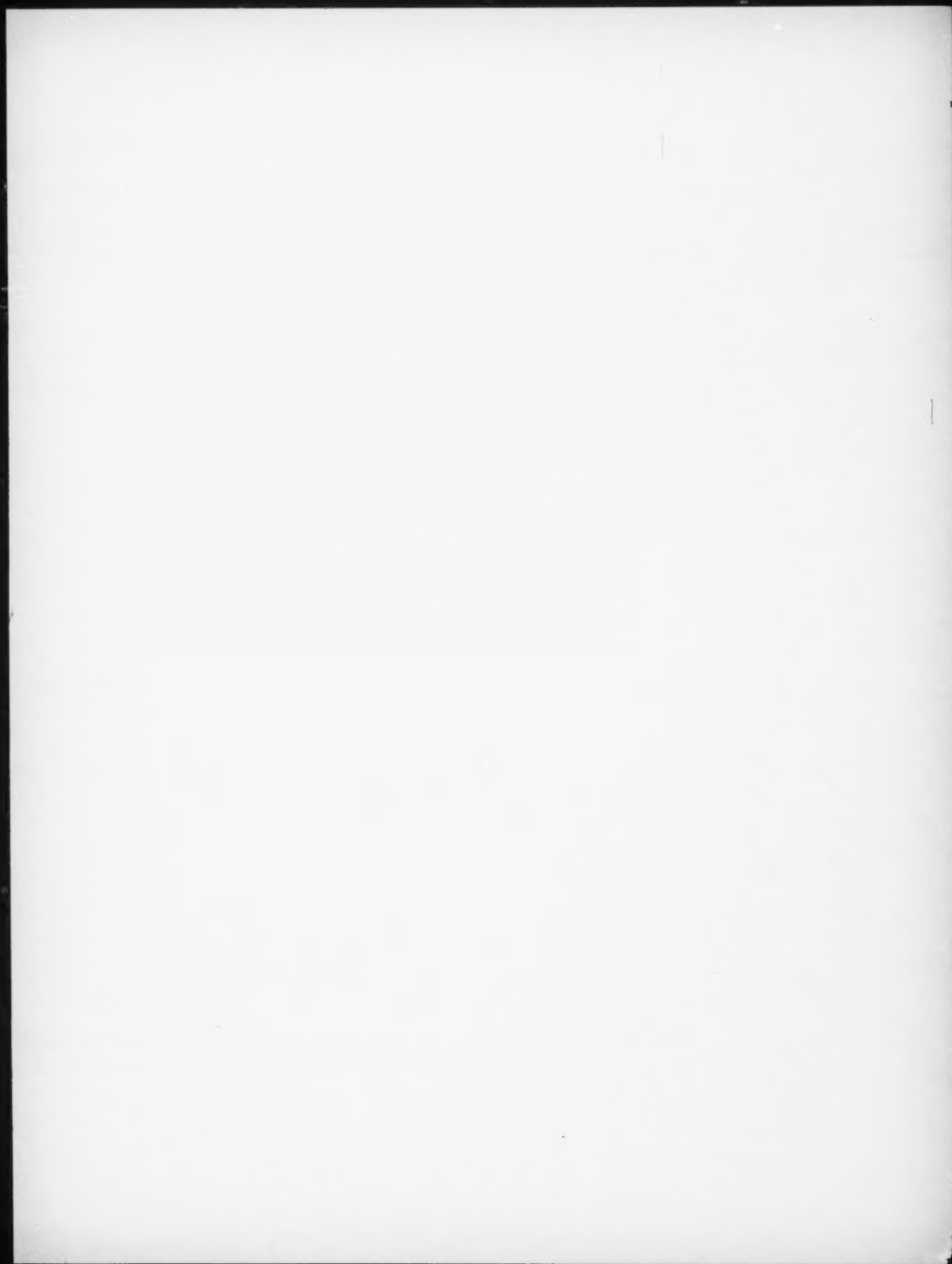
Rankings on the list of the fastest growing companies are based on growth in stockholders' equity. Companies also must have positive net income for 1990 and 1989 and increases in net income in 1990. Subsidiary companies, newly public companies, and limited partnerships are not included.

Most of the companies posted substantial increases in net income in 1990. Fifteen of the 20 companies in the fastest growing list had increases of 100% or more.

Long term debt positions of companies on the fast-growth list were mixed. Twelve of the companies reduced long term debt, five increased long term debt, and three were unchanged with no long term debt.

Lomak Petroleum Inc. led the list this year. Its stockholders' equity moved up 518.1%, and net income increased 176.7% to \$285,000 in 1990. The company ranked 204 in assets.

Five of the companies were on the fast-growth list last year. One company, Plains Petroleum, made the list for the fourth year in a row. Whiting Petroleum is on the list for the third consecutive year. American Exploration, Tide West Oil, and Nucorp were on the list for the second year in a row. Nucorp led the list last year.



Rank by total assets		Company	Total assets \$000	Total revenue		Net income		Stockholders' equity		Capital & expl. spending	
1990	1989			Rank	\$000	Rank	\$000	Rank	\$000	Rank	\$000
1	1	Exxon Corp.	87,707,000	1	116,940,000	1	5,010,000	1	33,055,000	1	7,505,000
2	2	Mobil Corp.	41,665,000	2	64,472,000	5	1,929,000	2	17,072,000	2	4,374,000
3	3	Chevron Corp.	35,089,000	3	42,566,000	3	2,157,000	4	14,836,000	3	3,878,000
4	4	Amoco Corp.	32,209,000	5	31,581,000	6	1,913,000	5	14,068,000	4	3,714,000
5	5	Shell Oil Co. ¹	28,496,000	6	24,790,000	9	1,036,000	3	16,335,000	5	2,805,000
6	6	Texaco Inc.	25,975,000	4	41,822,000	7	1,450,000	6	9,385,000	6	2,731,000
7	7	ARCO (Atlantic Richfield Corp.)	23,864,000	8	19,896,000	4	2,011,000	7	7,149,000	7	2,718,000
8	8	Occidental Petroleum Corp.	19,743,000	7	22,060,000	299	(1,695,000)	8	4,112,000	12	1,576,000
9	9	BP (USA) ²	18,725,000	9	18,620,000	2	³ 2,631,000	—	NA	11	1,614,000
10	11	Phillips Petroleum Co.	12,130,000	11	13,975,000	10	779,000	11	2,719,000	13	1,383,000
11	10	USX-Marathon Group ⁴	11,931,000	12	13,535,000	11	508,000	9	3,625,000	15	1,299,000
12	12	Conoco Inc. ⁵	11,640,000	10	15,976,000	8	⁶ 1,078,000	—	NA	8	1,925,000
13	14	Enron Corp.	9,849,302	13	13,197,677	18	202,180	15	1,856,173	18	698,080
14	13	Unocal Corp.	9,762,000	14	11,808,000	13	401,000	12	2,550,000	14	1,316,000
15	15	Coastal Corp.	9,229,600	15	9,490,400	16	225,600	14	1,981,000	22	586,500
16	16	Amerada Hess Corp.	9,056,636	17	7,081,098	12	482,713	10	3,106,029	10	1,737,627
17	17	Columbia Gas System Inc.	6,196,300	24	2,428,200	29	104,700	17	1,757,800	20	600,100
18	18	Pennzoil Co.	5,260,652	25	2,366,661	32	93,768	21	1,251,620	32	304,893
19	21	Oryx Energy Co.	5,252,000	27	2,124,000	17	225,000	31	622,000	9	1,880,000
20	20	Ashland Oil Inc. ⁷	5,117,900	16	9,100,038	20	182,059	20	1,280,013	26	445,729
21	22	Arkla, Inc.	5,114,065	23	2,436,244	28	105,871	19	1,285,359	27	428,257
22	19	Consolidated Natural Gas Co.	5,006,038	22	2,714,871	21	163,770	16	1,844,594	28	407,567
23	—	Transco Energy Co.	4,548,873	20	3,112,115	46	41,168	35	600,487	17	705,990
24	23	Freeport-McMoRan Inc.	3,587,623	29	1,580,555	14	313,580	32	620,110	19	609,947
25	24	Kerr-McGee Corp.	3,473,000	19	3,701,000	22	150,000	18	1,491,000	24	583,000
26	—	Meridian Oil Inc. ⁸	3,440,774	34	1,022,230	19	189,954	13	2,520,059	16	883,105
27	25	Enserch Corp.	3,264,229	21	2,815,081	30	102,796	25	898,883	41	204,559
28	26	Sonat Inc.	3,195,555	32	1,523,415	27	110,689	23	1,164,936	21	591,671
29	28	American Petrofina Inc. ⁹	2,846,055	18	3,979,002	23	125,543	24	1,140,529	30	348,583
30	30	Mitchell Energy & Development Corp. ¹⁰	2,216,235	40	791,277	44	47,255	34	610,945	37	229,253
31	29	Nicor Inc.	2,179,900	31	1,545,800	26	113,500	30	676,300	43	173,900
32	27	Mesa L.P.	2,168,002	55	346,041	297	(208,925)	50	¹¹ 367,981	76	45,020
33	33	Union Pacific Resources Co. ¹²	2,164,800	36	1,000,900	15	240,000	22	1,214,100	25	532,300
34	31	Murphy Oil Corp.	2,136,995	26	2,138,994	25	114,009	26	873,163	33	300,991
35	34	Union Texas Petroleum Holdings Inc.	2,101,860	33	1,332,467	24	116,001	49	374,726	29	384,028
36	32	Montana Power Co.	1,985,404	39	843,589	31	94,980	27	788,389	52	107,014
37	38	Cabot Corp. ⁷	1,731,909	28	1,684,658	35	71,030	37	570,589	42	182,815
38	36	Anadarko Petroleum Corp.	1,646,750	51	389,214	39	55,222	33	617,969	38	212,574
39	37	Maxus Energy Corp.	1,470,200	41	700,600	81	7,300	292	(23,100)	35	272,900
40	39	National Fuel Gas Co. ⁷	1,436,687	37	899,492	41	51,998	41	484,044	45	161,501
41	41	Louisiana Land & Exploration Co.	1,226,000	38	884,800	40	54,900	45	448,700	36	245,700
42	43	Pacific Enterprises Oil & Gas Co. ¹³	1,180,000	56	346,000	33	¹⁴ 87,000	39	506,000	40	205,000
43	42	Equitable Resources Inc.	1,176,926	44	660,206	37	58,949	38	528,502	53	101,426
44	45	Questar Corp.	1,150,953	46	546,684	38	57,520	43	460,473	49	137,872
45	46	Enserch Exploration Partners Ltd. ¹⁷	1,109,203	67	202,035	55	25,993	28	777,210	50	121,301
46	53	Hamilton Oil Corp.	957,361	61	252,140	50	30,852	48	378,862	44	168,721
47	—	Energy Development Corp. ¹⁸	950,455	71	186,039	57	23,760	53	326,188	34	291,033
48	48	Oreok Inc. ¹⁹	939,715	42	673,203	48	32,960	52	333,205	62	68,500
49	49	Santa Fe Energy Resources Inc.	911,100	52	388,100	67	17,000	57	215,800	51	117,800
50	47	Ocean Drilling & Exploration Co.	905,557	58	281,735	34	77,660	44	455,629	57	88,314
51	50	Grace Energy Corp. ²⁰	891,023	48	500,841	62	22,476	36	578,327	48	138,734
52	81	AMAX Oil & Gas Inc. ²¹	841,201	85	83,823	65	17,949	29	747,350	23	583,188
53	52	Apache Corp.	829,634	59	273,410	47	40,297	47	386,780	46	145,329

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
1	584.0	2	1,497.0	1	6,331.0	1	24,924.0	2	234.0	3	724.0	4	2,437.0	2	9,542.0	9	325,000
6	243.0	1	1,610.0	5	2,664.0	2	19,143.0	8	102.0	5	600.0	8	1,207.0	3	7,149.0	4	530,000
2	306.0	4	1,107.0	4	2,794.0	4	9,301.0	5	167.0	1	967.0	5	1,653.0	4	7,086.0	5	518,000
3	281.0	3	1,236.0	6	2,660.0	3	19,023.0	7	127.0	4	707.0	7	1,559.0	1	12,480.0	3	699,000
7	197.0	7	526.0	2	3,061.0	6	6,795.0	4	168.0	7	517.0	1	2,823.0	5	6,398.0	1	762,000
4	261.0	5	817.0	7	2,351.0	8	5,998.0	6	167.0	2	741.0	6	1,600.0	7	4,849.0	2	755,000
5	257.0	6	638.0	3	2,930.0	5	8,052.0	3	233.0	6	567.0	2	2,720.0	6	6,256.0	6	481,000
11	80.00	13	258.0	13	752.0	14	2,556.0	15	24.00	13	234.0	15	197.0	13	2,335.0	12	261,400
—	0	—	0	—	0	—	0	1	269.0	17	165.0	3	2,473.0	11	3,040.0	24	119,200
9	98.00	9	465.0	8	1,114.0	9	5,663.0	11	49.00	9	319.0	12	507.0	10	3,806.0	15	222,000
13	71.92	10	423.8	10	846.0	11	4,462.0	12	46.01	10	288.3	9	572.0	12	2,391.0	8	359,000
8	131.0	11	374.0	9	1,045.0	12	3,850.0	13	44.00	12	237.0	13	475.0	14	2,299.0	13	257,400
41	3.132	18	171.1	45	23.13	20	1,475.0	47	2.255	18	164.5	52	16.27	19	1,343.5	20	146,680
10	87.00	8	521.0	11	823.0	7	6,574.0	9	52.00	8	324.0	10	561.0	9	4,260.0	11	274,000
36	3.754	26	93.61	36	33.20	25	1,084.9	33	3.754	26	93.61	30	33.20	24	1,084.9	46	46,400
14	63.00	14	257.0	14	611.0	13	2,683.0	14	26.00	16	167.0	16	197.0	22	1,152.0	40	57,000
48	2.688	31	75.30	52	18.99	27	925.7	49	2.057	33	72.30	54	14.74	27	812.5	16	203,000
25	11.00	21	138.0	17	156.0	26	927.0	20	11.00	22	137.0	17	153.0	26	892.0	19	155,200
12	77.00	12	281.0	12	768.0	15	2,031.0	10	51.00	11	261.0	11	523.0	16	1,885.0	17	193,000
20	15.30	64	19.80	40	31.00	47	387.7	79	0.700	60	19.80	117	2.900	44	387.7	27	111,000
87	0.709	38	58.16	73	9.037	32	735.2	78	0.709	38	58.16	68	9.037	29	735.2	34	87,986
29	5.457	20	147.0	33	38.21	24	1,112.0	26	4.992	20	147.0	29	33.44	23	1,111.0	32	96,200
236	0.028	142	2.240	219	0.363	103	57.75	234	0.028	140	2.240	211	0.363	97	57.75	82	12,900
35	4.314	34	70.16	25	74.46	35	661.6	31	4.314	34	70.16	22	74.46	31	661.6	30	97,180
18	18.40	28	92.80	19	136.3	30	825.7	24	7.600	27	79.70	26	51.00	36	541.4	42	53,940
21	15.19	15	228.5	22	109.6	10	4,703.0	19	15.19	14	228.5	20	109.6	8	4,703.0	7	456,700
40	3.195	29	76.84	39	32.27	21	1,236.9	39	3.036	28	76.84	32	31.11	20	1,224.1	44	52,500
46	2.774	24	96.70	55	18.22	28	905.2	41	2.774	23	96.70	48	18.22	25	905.2	23	123,670
27	8.211	32	74.84	30	54.85	33	671.5	23	8.211	31	74.84	25	54.85	30	671.5	28	105,500
19	15.60	39	56.70	21	120.2	38	576.6	18	15.60	39	56.70	19	120.2	34	576.6	33	91,300
77	0.900	60	21.80	98	5.500	82	116.3	70	0.900	58	21.80	89	5.500	77	116.3	71	18,800
30	5.233	22	137.3	23	101.7	16	1,971.3	25	5.233	21	137.3	21	101.7	15	1,971.3	22	123,900
15	22.90	16	202.6	18	153.0	18	1,694.4	16	22.90	15	202.6	18	153.0	17	1,694.4	10	296,000
23	14.30	27	93.20	26	67.60	36	653.6	27	4.900	32	74.10	40	23.90	45	378.5	58	29,200
24	12.50	17	176.0	20	134.1	19	1,488.1	35	3.497	30	75.20	38	27.22	42	423.2	49	42,650
78	0.880	63	20.10	82	7.379	44	1,432.1	94	0.525	74	11.72	107	3.854	55	1,222.7	74	17,140
144	0.175	44	39.66	159	1.340	31	735.7	139	0.175	44	39.66	151	1.340	28	735.7	25	117,300
33	4.599	19	150.3	37	32.60	17	1,704.3	32	4.065	19	148.2	37	27.75	18	1,650.3	26	116,900
16	19.61	23	97.82	16	171.0	34	663.3	34	3.724	24	95.19	42	22.30	32	641.9	54	33,300
90	0.677	77	11.99	57	16.99	73	155.3	84	140.677	73	141.99	50	16.99	68	145.3	47	46,000
22	15.00	33	74.10	24	87.80	29	852.1	22	8.500	40	55.30	27	45.10	38	513.1	56	32,800
26	10.86	43	48.54	28	59.79	55	254.7	21	10.25	43	45.56	24	55.90	60	184.7	21	145,300
55	1.635	45	39.31	66	12.25	37	620.8	53	1.635	45	39.31	60	12.25	33	620.8	14	235,000
51	162.279	46	1638.59	63	1612.59	40	16515.0	46	162.279	46	1638.59	58	1612.59	37	16515.0	60	28,000
47	2.758	30	76.75	43	28.73	22	1,223.2	42	2.758	29	76.75	35	28.73	21	1,223.2	43	52,500
53	1.910	40	56.23	29	57.75	23	1,148.0	132	0.204	94	5.601	127	2.329	160	18.72	190	0.190
52	2.201	36	64.00	56	17.38	39	550.0	48	2.201	36	64.00	49	17.38	35	550.0	—	NA
122	0.256	87	7.338	168	1.100	115	46.58	119	0.256	85	7.338	162	1.100	111	46.58	—	NA
17	19.00	48	37.40	15	222.3	64	185.9	17	19.00	48	37.40	14	222.3	59	185.9	18	186,000
28	5.700	37	63.80	53	18.80	51	297.3	45	2.300	37	59.00	67	9.300	52	260.5	92	10,484
66	1.209	53	29.23	81	7.465	61	203.6	63	1.209	53	29.23	76	7.465	57	203.6	76	16,300
60	1.389	58	22.38	34	36.97	42	482.2	58	1.365	57	22.21	31	32.61	40	434.5	55	32,800
38	3.373	25	94.55	46	22.74	41	500.3	36	3.373	25	94.55	41	22.74	39	500.3	31	96,830

Rank by total assets		Company	Total assets \$000	Total revenue		Net income		Stockholders' equity		Capital & expl. spending	
1990	1989			Rank	\$000	Rank	\$000	Rank	\$000	Rank	\$000
54	62	Nerco Oil & Gas Inc. ²²	725,600	65	214,800	42	51,100	40	498,800	31	318,300
55	56	Cenex, Farmer's Union Central Exchange Inc. ⁷	713,169	30	1,566,676	45	44,055	51	336,203	98	20,722
56	44	BHP Petroleum (Americas) Inc. ^{23,24}	691,896	68	201,912	298	(277,858)	46	405,071	56	91,165
57	54	Triton Energy Corp. ²⁴	646,128	60	260,146	293	(54,176)	63	173,796	58	84,093
58	55	Zapata Corp. ⁷	615,380	83	93,483	295	(105,244)	294	(174,557)	145	5,341
59	60	Noble Affiliates Inc.	588,071	62	243,196	52	28,554	56	250,851	47	145,302
60	57	Helmerich & Payno Inc. ⁷	582,927	63	238,544	43	47,562	42	479,485	75	46,568
61	70	Dekalb Energy Co.	558,892	81	102,903	53	27,159	55	251,251	39	207,150
62	58	Global Marine Inc.	543,700	57	287,200	292	(35,800)	256	900	100	19,300
63	64	Adobe Resources Corp.	522,215	72	160,478	266	(1,725)	54	322,611	54	99,167
64	65	First Mississippi Corp. ²⁵	511,700	47	501,236	97	4,374	62	189,591	64	64,600
65	67	Tesoro Petroleum Corp. ⁷	511,161	35	1,006,519	61	22,702	69	141,385	94	23,082
66	63	Presidio Oil Co.	507,828	77	123,862	151	830	71	124,121	68	53,855
67	74	Edisto Resources Corp.	492,289	69	191,139	272	(2,774)	64	170,319	55	91,505
68	68	Pogo Producing Co.	425,435	73	156,162	64	18,158	105	52,246	83	37,532
69	73	Southern Union Co.	406,376	66	202,725	263	(1,385)	68	146,332	99	20,101
70	75	Seagull Energy Corp.	385,997	64	226,057	63	20,569	59	192,516	66	58,589
71	72	Southwestern Energy Co.	366,313	78	118,462	71	14,075	72	120,709	84	33,438
72	—	Tredegar Industries	342,168	45	548,489	290	(24,686)	67	147,261	81	39,717
73	—	Santa Fe Energy Partners LP	340,100	76	136,300	281	(7,700)	60	¹¹ 191,700	60	76,500
74	66	Forest Oil Corp.	339,676	84	84,824	294	(75,549)	101	58,457	63	66,085
75	71	National Cooperative Refinery Association ²⁵	336,500	43	662,885	51	29,083	58	²⁶ 206,164	93	23,976
76	80	Nomeco Oil & Gas Co. ²⁷	301,946	89	75,024	77	8,160	66	159,084	59	81,834
77	79	Norcen Energy Resources Ltd. (US Operations)	281,953	99	58,664	60	22,815	—	NA	65	60,252
78	84	Noble Drilling Corp.	271,416	75	137,434	283	(8,751)	65	169,461	67	56,700
79	76	Hondo Oil & Gas ^{7,28}	257,935	53	365,743	72	12,634	95	69,660	72 [*]	47,854
80	—	Giant Industries	254,504	54	355,855	83	6,996	76	107,433	74	47,246
81	89	Snyder Oil Corp. ²⁹	227,198	86	82,173	79	7,515	74	115,187	80	40,307
82	59	Hadson Corp.	225,174	50	452,383	296	(142,409)	291	(18,735)	133	6,981
83	82	Diamond Shamrock Offshore Partners L.P. ³⁰	222,357	79	113,465	54	26,766	61	¹¹ 190,009	69	53,400
84	77	American Exploration Co.	220,453	94	62,922	102	4,049	83	91,937	95	22,882
85	117	Hallwood Energy Partners LP	215,470	87	82,016	291	(33,517)	77	¹¹ 105,005	143	5,598
86	85	Parker & Parsley Petroleum Co. ³¹	197,148	93	63,985	75	10,245	75	107,549	87	30,661
87	152	Nucorp Inc.	194,260	111	38,551	96	5,273	110	45,870	255	183
88	87	Allegheny & Western Energy Corp. ²⁵	190,726	70	188,361	110	2,984	82	92,865	105	16,841
89	83	TGX Corp.	188,437	92	73,848	284	(10,842)	91	71,680	209	798
90	91	Global Natural Resources Inc.	179,216	98	61,573	78	7,975	79	101,240	78	42,466
91	100	Energy Ventures Inc.	170,259	74	154,249	49	31,621	87	76,631	107	16,467
92	101	Exploration Co. of Louisiana Inc.	168,413	175	9,348	140	1,087	73	117,587	61	73,768
93	86	Wainoco Oil Corp.	167,510	104	49,053	288	(18,573)	97	61,774	71	48,503
94	92	Howell Corp.	159,659	49	485,941	59	22,959	104	52,572	106	16,612
95	88	Conquest Exploration Co.	150,461	101	55,864	280	(7,697)	98	61,701	111	14,357
96	—	Chieftain International	144,380	109	42,406	80	7,324	70	132,637	92	26,747
97	—	Hadson Energy Resources Corp.	131,473	110	39,343	88	6,692	89	73,678	113	13,296
98	96	Beard Oil Co.	130,852	103	50,991	287	(13,293)	144	22,111	73	47,606
99	93	Berry Petroleum Co.	130,554	91	73,891	66	17,656	78	104,521	112	13,617
100	—	Nuevo Energy Co.	128,489	121	30,375	85	6,834	84	88,276	79	40,748
101	—	Cliffs Drilling Co.	124,372	88	79,765	276	(3,854)	85	87,247	110	15,187
102	98	Devon Energy Corp.	123,547	120	30,918	115	2,555	94	70,767	86	30,938
103	—	Vintage Petroleum	123,190	102	51,249	86	6,764	96	62,863	90	27,585
104	109	Kelley Oil & Gas Partners Ltd.	118,990	122	29,639	98	4,318	92	¹¹ 71,499	82	38,348
105	104	Swift Energy Co.	118,227	132	20,390	82	7,171	127	35,668	125	8,600
106	156	Castle Energy Corp. ⁷	113,456	177	9,139	114	2,575	109	46,626	191	1,191

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
50	2.407	35	69.24	60	13.66	45	425.5	44	2.407	35	69.24	56	13.66	41	425.5	100	8.880
57	1.471	195	0.799	69	10.69	206	7.824	55	1.471	189	0.799	64	10.69	200	7.824	66	21.000
32	4.787	42	52.07	35	34.33	43	453.9	30	4.375	42	49.95	33	30.21	43	411.5	37	60.000
37	3.504	57	22.95	31	51.79	75	140.5	83	0.685	90	6.418	120	2.647	131	28.10	104	8.620
162	0.123	66	17.32	156	1.392	89	94.79	183	0.074	65	15.54	194	0.607	92	68.87	—	0.000
31	4.814	41	56.19	32	40.56	48	349.9	29	4.443	41	53.63	28	34.85	47	325.8	45	50.730
81	0.827	56	23.78	77	8.103	53	279.9	72	0.827	55	23.78	71	8.103	50	279.9	77	15.336
43	2.984	55	26.77	41	29.26	46	388.8	51	1.935	77	11.35	55	13.88	82	93.73	53	35.000
131	0.232	79	11.55	165	1.239	120	39.87	128	0.232	75	11.55	159	1.239	115	39.87	—	NA
44	2.847	54	27.34	38	32.58	57	228.2	50	1.938	54	27.34	39	26.94	54	228.2	62	25.060
96	0.546	111	4.154	109	4.088	112	46.76	91	0.546	110	4.154	101	4.088	108	46.76	105	8.400
70	1.095	101	4.881	61	13.29	87	96.16	292	0.001	230	0.257	293	0.004	184	11.12	138	2.220
39	3.309	59	22.36	47	21.74	54	265.1	37	3.309	56	22.36	43	21.74	51	265.1	39	58.390
95	0.553	51	32.02	70	10.68	71	156.3	90	0.553	51	32.02	65	10.68	66	156.3	67	20.800
49	2.476	47	37.52	51	19.09	59	217.5	43	2.476	47	37.52	46	19.09	56	217.5	80	14.200
145	0.169	98	5.022	163	1.321	105	50.86	141	0.169	98	5.022	155	1.321	99	50.86	129	3.700
82	0.813	72	14.24	96	5.791	79	127.7	73	0.813	67	14.24	86	5.791	73	127.7	73	17.790
168	0.112	70	16.44	188	0.773	50	304.5	162	0.112	64	16.44	182	0.773	48	304.5	89	11.200
134	0.225	155	1.989	202	0.559	195	10.15	137	0.180	192	0.768	227	0.272	—	0	143	1.750
34	4.500	50	35.50	44	28.10	68	171.9	28	4.500	50	35.50	36	28.10	63	171.9	50	41.100
76	0.912	52	31.42	88	6.559	60	205.0	82	0.689	52	29.64	99	4.175	61	178.6	95	9.700
65	1.222	97	5.034	78	7.985	96	74.71	62	1.222	97	5.034	72	7.985	87	74.71	57	30.100
63	1.296	75	13.29	49	19.50	67	172.1	66	1.071	69	13.25	87	5.637	65	167.9	29	101.000
99	0.519	85	8.926	87	6.924	74	153.6	95	0.519	82	8.926	80	6.924	69	153.6	87	11.500
154	0.152	193	0.810	157	1.366	182	12.84	207	0.047	209	0.495	219	0.303	231	3.222	147	1.370
45	2.832	71	14.39	54	18.50	85	97.35	40	2.832	66	14.39	47	18.50	79	97.35	63	24.200
98	0.534	174	1.343	107	4.203	117	44.10	93	0.534	169	1.343	98	4.203	113	44.10	—	NA
72	1.049	76	12.77	50	19.41	56	241.2	67	1.049	71	12.77	45	19.41	53	241.2	68	19.700
—	0	—	0	102	4.936	124	36.85	—	0	—	0	140	1.752	145	23.31	—	NA
54	1.839	49	36.04	68	11.35	63	186.8	52	1.839	49	36.04	63	11.35	58	186.8	81	13.300
64	1.240	74	13.42	71	10.38	62	188.6	61	1.238	70	13.13	66	10.28	76	119.5	65	21.160
58	1.459	65	19.07	62	12.75	65	173.0	56	1.459	61	19.07	57	12.75	62	173.0	—	NA
56	1.560	80	11.55	42	29.22	83	107.8	54	1.560	76	11.55	34	29.22	78	107.8	48	43.100
141	0.185	203	0.647	182	0.830	240	2.476	136	0.185	198	0.647	176	0.830	238	2.476	—	0.000
208	0.051	159	1.887	240	0.200	157	20.37	204	0.051	156	1.887	237	0.200	152	20.37	—	NA
157	0.143	109	4.386	127	2.509	72	156.2	151	0.143	107	4.386	123	2.509	67	156.2	—	0.000
85	0.731	78	11.78	99	5.270	70	158.9	81	140.690	84	148.645	102	144.088	84	148.058	72	18.500
260	0.012	172	1.393	288	0.020	276	0.263	258	0.012	167	1.393	288	0.020	276	0.263	160	0.900
175	0.093	113	3.742	178	0.917	76	132.4	171	0.093	112	3.742	172	0.917	70	132.4	—	NA
80	0.829	61	21.16	83	7.263	58	220.2	98	0.481	108	4.325	90	5.221	121	36.38	118	5.690
84	0.734	104	4.648	86	7.048	98	73.17	76	0.734	103	4.648	79	7.048	89	73.17	123	4.510
74	0.990	69	16.49	94	5.844	84	100.3	74	0.799	72	12.06	96	4.556	95	59.49	120	5.200
91	0.652	68	16.88	84	7.139	113	46.72	85	0.652	63	16.88	77	7.139	109	46.72	115	6.110
67	1.158	105	4.598	72	10.07	94	75.21	138	0.179	104	4.598	109	3.575	106	47.58	—	NA
73	0.994	138	2.435	104	4.917	189	10.94	68	0.994	136	2.435	93	4.917	185	10.94	36	60.250
42	3.114	217	0.439	27	65.19	158	20.26	38	3.114	215	0.439	23	65.19	153	20.26	91	10.720
117	0.309	82	11.18	144	1.771	80	126.6	114	0.309	79	11.18	139	1.771	74	126.6	—	NA
198	0.065	175	1.324	243	0.193	217	4.982	194	0.065	170	1.324	240	0.193	212	4.982	142	1.770
97	0.545	83	9.314	111	4.058	69	169.5	92	0.545	80	9.314	104	4.058	64	169.5	70	19.570
71	1.094	84	8.956	59	15.82	81	123.6	65	1.094	81	8.956	53	15.82	75	123.6	78	15.130
127	0.242	73	13.52	135	2.077	77	130.0	124	0.242	68	13.52	132	2.077	71	130.0	103	8.710
160	0.132	136	2.512	145	1.691	131	30.73	154	0.132	134	2.512	141	1.691	126	30.73	—	0.000
173	0.098	156	1.941	233	0.266	180	13.70	169	0.098	153	1.941	228	0.266	175	13.70	108	7.600

Rank by total assets		Company	Total assets \$000	Total revenue		Net income \$000	Stockholders' equity		Capital & expl. spending		
1990	1989			Rank	\$000		Rank	\$000	Rank	\$000	Rank	$000
107	95	Wiser Oil Co.	110,143	107	43,997	87	6,723	81	93,829	109	16,277
108	106	Fuel Resources Inc. ^{7,32}	109,920	97	61,714	—	NA	—	NA	88	29,377
109	122	Buttes Gas & Oil Co.	104,141	143	18,019	269	(2,200)	136	27,746	120	10,026
110	97	Crystal Oil Co.	97,151	117	31,883	103	3,942	86	77,547	136	6,638
111	99	San Juan Basin Royalty Trust	96,120	144	17,005	69	³³ 16,380	80	¹⁴ 95,677	—	0
112	113	Tom Brown Inc. ³⁵	94,998	149	15,317	267	(2,058)	93	71,366	130	7,867
113	119	Plains Resources Inc.	94,812	106	44,146	268	(2,174)	130	34,296	89	28,585
114	124	Plains Petroleum Co.	91,348	105	48,791	68	16,796	90	73,280	117	11,509
115	110	Unit Corp.	86,286	95	62,436	152	830	121	38,121	104	17,303
116	115	Production Operators Corp. ^{7,36}	83,506	100	57,155	94	5,457	131	33,987	97	21,195
117	135	Fuel Resources Development Co. ³⁷	83,440	116	32,259	187	175	143	22,118	77	42,880
118	131	Coho Resources Inc. ³⁸	82,506	128	22,602	90	6,671	113	43,491	85	33,432
119	—	Prudential-Bache Energy Income L.P. VI P-25	81,118	130	21,577	92	5,931	88	¹¹ 74,228	170	1,905
120	120	Washington Energy Resources ^{7,39}	80,376	136	19,525	100	⁴⁰ 4,269	—	NA	103	17,750
121	102	Patrick Petroleum Co.	78,416	150	15,016	286	(12,425)	117	42,579	108	16,327
122	108	Damson Oil Corp. ⁹	71,883	131	21,384	285	(12,133)	293	(32,023)	163	2,508
123	129	Taurus Exploration, Inc. ^{7,41}	68,576	153	12,983	99	4,311	145	21,648	101	19,037
124	103	Wolverine Exploration Co.	67,434	108	43,972	289	(19,046)	158	16,145	70	49,449
125	114	Prudential-Bache Energy Income L.P. V P-21	67,210	140	18,430	104	3,822	99	¹¹ 60,496	204	849
126	107	Integrated Drilling and Exploration Inc. ⁴²	66,826	112	35,541	279	(6,185)	107	51,271	140	5,867
127	116	Prudential-Bache Energy Income L.P. V P-19	66,143	129	21,818	113	2,613	100	¹¹ 60,338	225	497
128	153	OKC Limited Partnership	64,037	82	96,631	36	62,885	102	¹⁵ 55,913	114	12,925
129	125	Samson Energy Co. L.P.	62,710	141	18,232	160	637	129	¹¹ 34,355	116	11,825
130	111	Key Production Co. Inc.	62,558	119	31,293	105	3,473	119	40,467	179	1,675
131	159	Kelley Oil Corp.	60,835	96	61,774	118	2,332	137	26,446	115	12,607
132	130	Apache Offshore Investment Partnership ⁴³	59,131	146	16,243	282	(8,215)	170	¹¹ 11,760	167	2,044
133	126	Equity Oil Co.	58,757	135	19,587	121	2,151	116	42,843	127	8,013
134	118	Prudential-Bache Energy Income L.P. IV P-17	58,180	139	18,945	124	1,988	103	¹¹ 54,166	182	1,551
135	105	Sage Energy Co. ²⁰	56,341	114	34,344	271	(2,627)	288	(1,990)	123	9,171
136	121	Prudential-Bache Energy Income L.P. IV P-16	56,067	142	18,210	144	956	106	¹¹ 51,292	183	1,505
137	123	Prudential-Bache Energy Income L.P. V P-22	54,550	152	13,452	161	627	108	¹¹ 48,812	175	1,741
138	139	Wilshire Oil Co. of Texas	52,366	168	9,952	150	843	166	13,636	153	4,641
139	173	Barrett Resources Corp. ⁷	51,322	180	8,430	129	1,465	120	40,412	128	7,944
140	143	KCS Group Inc. ⁷	51,058	90	74,032	117	2,402	141	23,093	91	26,837
141	150	Maynard Oil Co.	50,528	125	26,952	107	3,254	132	32,878	96	22,614
142	—	Prudential-Bache Energy Income L.P. VI P-23	50,047	184	7,885	264	(1,555)	114	¹¹ 43,490	174	1,776
143	—	Prudential-Bache Energy Income L.P. VI P-24	49,602	186	7,631	265	(1,601)	115	¹¹ 43,062	176	1,739
144	147	Fidelity Oil Group ⁴⁴	48,993	134	20,046	76	8,254	122	37,400	102	18,388
145	127	Prudential-Bache Energy Income L.P. V P-18	48,777	145	16,284	130	1,429	111	¹¹ 44,262	215	622
146	—	Magellan Petroleum Corp. ²⁵	48,380	163	11,528	235	(233)	147	19,397	146	5,179
147	128	Prudential-Bache Energy Income L.P. V P-20	48,080	154	12,930	111	2,646	112	¹¹ 43,663	239	359
148	151	Geodyne Resources Inc. ⁴⁵	46,140	133	20,357	101	4,196	142	22,203	200	890
149	138	Texas Meridian Resources Ltd.	45,360	160	11,815	277	(4,383)	214	4,327	150	4,977
150	187	DI Industries Inc. ⁴⁶	45,054	115	32,632	257	(954)	125	36,091	208	835
151	145	McFarland Energy Inc.	44,676	137	19,424	120	2,281	135	31,503	118	11,022
152	157	Comstock Resources Inc.	44,244	204	4,844	253	(632)	124	36,840	131	7,717
153	132	Prudential-Bache Energy Income L.P. III P-14	44,082	173	9,707	139	1,098	118	¹¹ 40,686	216	619
154	137	Penn Virginia Resources Corp. ⁴⁷	43,340	198	5,549	270	(2,495)	—	NA	152	4,885
155	140	American National Petroleum Co.	40,935	155	12,700	166	536	162	14,892	162	2,661
156	142	Prudential-Bache Energy Income L.P. III P-12	40,298	176	9,269	112	2,642	123	¹¹ 36,864	243	332
157	154	New London Inc. ⁴⁸	40,068	118	31,773	135	1,247	139	25,655	132	7,503
158	170	Convest Energy Corp.	39,867	151	14,070	106	3,272	134	31,772	138	6,208
159	148	Phoenix Resource Companies Inc.	38,170	124	27,415	84	6,970	289	(4,833)	134	6,839

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
62	1.321	96	5.451	64	12.50	92	78.88	60	1.321	96	5.451	59	12.50	85	78.88	41	57,000
203	0.059	88	7.267	225	0.329	95	75.02	200	0.059	86	7.267	217	0.329	86	75.02	—	NA
139	0.187	151	2.045	154	1.481	66	172.2	134	0.187	149	2.045	156	1.296	104	48.40	—	NA
83	0.783	89	7.036	105	4.788	114	46.61	75	0.783	87	7.036	95	4.788	110	46.61	121	4,800
255	0.015	129	3.117	180	0.849	52	281.5	252	0.015	127	3.117	174	0.849	49	281.5	170	0.700
109	0.431	140	2.395	85	7.079	91	81.33	104	0.431	138	2.395	78	7.079	83	81.33	109	7,500
115	0.342	108	4.389	101	4.987	107	50.20	112	0.342	106	4.389	92	4.987	101	50.20	88	11,200
104	0.473	62	20.50	75	8.790	49	346.9	101	0.473	59	20.50	69	8.790	46	346.9	51	41,000
114	0.351	94	5.830	124	2.675	119	40.36	111	0.351	93	5.736	119	2.675	116	39.45	69	19,700
108	0.431	120	3.404	134	2.144	207	7.760	105	0.431	119	3.404	131	2.144	201	7.760	134	3,000
118	0.293	116	3.594	185	0.793	123	37.00	115	0.293	115	3.594	179	0.793	119	37.00	38	59,430
68	1.128	240	0.147	48	19.76	181	13.13	64	1.128	241	0.147	44	19.76	177	13.13	61	27,600
89	0.695	122	3.290	90	6.264	86	97.02	80	0.695	121	3.290	81	6.264	80	97.02	—	0.000
106	0.451	95	5.780	116	3.495	93	77.69	106	0.424	95	5.531	115	3.048	91	72.52	96	9,400
119	0.292	117	3.567	149	1.554	149	23.86	116	0.292	116	3.567	144	1.554	143	23.86	110	7,220
126	0.242	154	1.990	152	1.519	173	16.03	122	0.242	152	1.990	147	1.519	169	16.03	—	0.000
183	0.080	100	4.953	224	0.330	104	57.53	178	0.080	100	4.953	216	0.330	98	57.53	59	29,100
94	0.579	67	17.22	179	0.872	136	28.06	88	¹⁴ 0.579	62	¹⁴ 17.22	173	¹⁴ 0.872	132	¹⁴ 28.06	75	16,800
110	0.408	103	4.730	80	7.697	102	59.12	107	0.408	102	4.730	75	7.697	96	59.12	—	0.000
178	0.088	131	3.052	190	0.723	150	23.70	174	0.088	129	3.052	184	0.723	144	23.70	152	1,000
92	0.637	114	3.724	97	5.631	168	16.98	86	0.637	113	3.724	88	5.631	165	16.98	—	0.000
100	0.508	110	4.304	122	3.035	132	30.28	96	0.508	109	4.304	116	3.035	127	30.28	167	0.750
123	0.248	90	6.758	155	1.423	109	49.61	120	0.248	88	6.758	148	1.423	103	49.61	101	8,830
103	0.478	81	11.27	129	2.445	111	47.15	100	0.478	78	11.27	125	2.445	107	47.15	—	NA
176	0.093	121	3.348	184	0.800	129	33.57	172	0.093	120	3.348	178	0.800	124	33.57	116	5,820
140	0.185	92	6.369	183	0.830	140	25.81	135	0.185	91	6.369	177	0.830	136	25.81	—	NA
88	0.697	170	1.431	74	8.930	148	23.93	89	0.561	176	1.125	74	7.732	157	19.52	117	5,730
102	0.480	107	4.447	113	3.899	139	26.67	99	0.480	105	4.447	106	3.899	135	26.67	—	0.000
59	1.398	99	4.968	79	7.823	130	31.06	57	1.398	99	4.968	73	7.823	125	31.06	79	15,120
101	0.481	112	4.134	110	4.069	144	24.55	97	0.481	111	4.134	103	4.069	140	24.55	—	0.000
138	0.188	102	4.795	131	2.257	106	50.66	133	0.188	101	4.795	128	2.257	100	50.66	—	0.000
142	0.181	128	3.140	136	2.046	126	36.22	155	0.130	144	2.174	170	0.946	187	10.55	—	NA
228	0.032	141	2.263	232	0.278	122	37.28	226	0.032	139	2.263	226	0.278	118	37.28	99	8,960
181	0.081	153	1.997	204	0.508	147	24.10	176	0.081	151	1.997	197	0.508	142	24.10	—	NA
111	0.392	125	3.183	108	4.140	155	21.34	108	0.392	124	3.183	100	4.140	150	21.34	131	3,392
272	0.007	118	3.496	249	0.162	99	72.80	269	0.007	117	3.496	247	0.162	90	72.80	—	0.000
273	0.007	119	3.409	250	0.156	97	74.54	270	0.007	118	3.409	248	0.156	88	74.54	—	0.000
61	1.374	160	1.846	65	12.40	172	16.10	59	1.346	160	1.600	51	12.20	176	13.20	90	11,000
105	0.454	124	3.215	112	3.933	183	12.69	102	0.454	123	3.215	105	3.933	178	12.69	—	0.000
137	0.200	106	4.594	171	1.051	88	95.79	241	0.020	234	0.219	238	0.197	254	0.773	—	NA
116	0.329	134	2.811	92	6.099	118	40.92	113	0.329	132	2.811	83	6.099	114	40.92	—	0.000
161	0.126	149	2.078	162	1.325	156	21.29	156	0.126	147	2.078	154	1.325	151	21.29	—	0.000
130	0.233	126	3.159	123	2.765	116	46.14	127	0.233	125	3.159	118	2.765	112	46.14	86	11,600
247	0.019	211	0.541	235	0.223	219	4.349	242	0.019	206	0.541	231	0.223	214	4.349	187	0.224
79	0.862	147	2.156	76	8.462	204	8.604	71	0.862	145	2.156	70	8.462	198	8.604	111	6,800
158	0.141	213	0.474	115	3.521	90	94.78	152	0.141	210	0.474	110	3.521	81	94.78	113	6,630
125	0.242	143	2.228	138	1.977	135	29.29	123	0.242	141	2.228	134	1.977	130	29.29	—	0.000
248	0.019	163	1.600	246	0.174	110	47.90	243	0.019	159	1.600	243	0.174	105	47.90	—	NA
143	0.175	115	3.693	160	1.340	125	36.49	140	0.175	114	3.693	152	1.340	120	36.49	145	1,690
164	0.118	139	2.403	169	1.094	100	62.16	159	0.118	137	2.403	163	1.094	93	62.16	—	0.000
121	0.258	187	0.933	132	2.236	194	10.25	118	0.258	183	0.933	129	2.236	189	10.25	119	5,223
113	0.382	164	1.598	100	5.060	162	18.94	110	0.382	161	1.598	91	5.060	158	18.94	94	9,960
69	1.104	229	0.299	89	6.419	190	10.83	195	0.064	228	0.299	244	0.171	261	0.543	—	0.000

Rank by total assets		Company	Total assets \$000	Total revenue		Net income		Stockholders' equity		Capital & expl. spending	
1990	1989			Rank	\$000	Rank	\$000	Rank	\$000	Rank	\$000
160	146	Prudential-Bache Energy Income L.P. III P-15	37,699	182	8,318	149	917	128	¹¹ 34,783	220	535
161	161	Alexander Energy Corp.	36,834	187	7,269	154	739	171	11,644	139	5,894
162	136	Prudential-Bache Energy Growth Fund L.P. G-1	36,269	191	6,582	275	(3,814)	126	¹¹ 35,853	244	318
163	134	Alanco Inc.	35,229	166	10,455	108	3,240	149	18,983	199	917
164	155	Garnet Resources Corp.	34,678	236	2,070	246	(400)	133	32,276	122	9,181
165	—	Gerrity Oil & Gas Corp.	34,206	165	10,998	142	957	146	20,481	119	10,176
166	172	Wichita River Oil Corp.	31,393	199	5,507	186	185	161	15,259	177	1,714
167	174	Belden & Blake Energy Co.	31,392	157	12,043	148	920	159	¹¹ 15,565	156	3,941
168	165	Petroleum Development Corp.	31,219	148	15,735	119	2,312	168	12,310	173	1,847
169	164	Coda Energy Inc. ²⁵	30,585	167	9,986	259	(1,027)	151	18,337	137	6,404
170	197	Plexus Resources Corp. ²⁵	28,738	221	2,830	251	(567)	157	16,752	272	61
171	162	Prudential-Bache Energy Income L.P. III P-13	28,360	195	6,203	158	658	138	¹¹ 26,170	237	388
172	190	Red Eagle Resources Corp.	28,028	113	34,472	123	1,994	172	11,221	126	8,347
173	179	Deminex U.S. Oil Co. ¹⁵	27,970	138	19,228	93	5,901	160	15,515	142	5,701
174	171	Resource America Inc. ⁷	27,711	174	9,613	126	1,650	140	23,823	157	3,935
175	278	Benton Oil & Gas Co.	27,253	205	4,677	188	159	180	10,064	147	5,136
176	112	Hollywood Energy Corp.	26,774	164	11,138	254	(764)	152	17,766	259	167
177	181	Sunlita Inc. ²⁵	23,767	159	11,865	169	474	148	19,042	195	1,067
178	166	Enex Resources Corp.	23,699	197	5,861	91	6,253	169	11,820	166	2,138
179	184	Belcor Inc. ⁴⁹	23,658	123	28,140	131	1,333	185	8,854	193	1,142
180	168	Callon Consolidated Partners L.P.	23,372	161	11,707	138	1,103	150	¹¹ 18,795	246	312
181	202	Arch Petroleum Inc. ⁴⁹	23,134	188	7,219	122	2,096	206	5,016	121	9,920
182	169	Blue Dolphin Energy Co.	21,258	208	4,387	274	(2,935)	184	9,245	247	288
183	201	American International Petroleum Corp.	20,917	237	2,061	273	(2,903)	220	3,667	148	5,083
184	200	Evergreen Resources Inc. ⁵⁰	20,430	211	3,935	179	281	153	17,600	180	1,668
185	163	Freeport-McMoran Oil and Gas Royalty Trust	19,962	147	15,920	70	³² 15,279	154	³⁴ 17,496	—	NA
186	182	Bradmar Petroleum Corp. ⁵¹	19,748	178	8,822	260	(1,244)	193	7,088	181	1,654
187	183	Prudential-Bache Energy Income L.P. II P-8	19,586	202	5,015	145	951	155	¹¹ 17,448	268	122
188	192	Adams Resources & Energy Inc.	19,567	80	110,003	125	1,844	217	4,048	172	1,848
189	178	Tipperary Corp. ⁷	19,557	171	9,862	89	6,688	189	8,240	211	733
190	267	Alta Energy Corp. ²⁵	19,125	185	7,735	219	(78)	207	4,800	164	2,479
191	186	Prudential-Bache Energy Income L.P. II P-10	18,968	207	4,427	137	1,154	156	¹¹ 17,242	260	151
192	233	Vantage Point Energy ⁵²	18,107	194	6,364	174	361	198	6,152	169	1,970
193	189	Columbus Energy Corp. ⁵³	17,651	172	9,836	156	722	187	8,555	190	1,197
194	235	HarCor Energy Inc.	16,317	201	5,370	229	(198)	224	3,301	154	4,588
195	207	PrimeEnergy Corp. ⁵⁴	16,023	169	9,949	132	1,304	196	6,580	168	2,007
196	195	Prudential-Bache Energy Income L.P. II P-11	15,941	213	3,681	146	944	163	¹¹ 14,544	266	130
197	205	Brock Exploration Corp. ⁴⁶	15,792	170	9,932	133	1,290	200	5,943	124	8,854
198	198	Tucker Drilling Co. Inc. ⁴⁶	15,709	162	11,602	256	(864)	164	13,789	160	2,877
199	196	Pan Petroleum MLP	15,499	214	3,417	244	(350)	167	¹¹ 12,647	218	608
200	208	Nakama & Weagant Energy Co. ¹⁰	15,294	217	3,238	147	937	178	10,210	149	5,046
201	242	Tide West Oil Co. ⁴⁵	15,245	192	6,400	127	1,559	213	4,331	129	7,884
202	215	Whiting Petroleum Corp.	15,215	179	8,431	109	3,008	173	11,221	155	4,124
203	—	Oakridge Energy Inc. ⁴⁵	14,336	200	5,486	74	10,714	179	10,138	158	3,859
204	244	Lomak Petroleum Inc.	13,765	190	7,057	178	285	197	6,453	189	1,240
205	194	LL & E Royalty Trust	13,716	158	11,920	73	³¹ 10,903	165	³⁴ 13,716	—	NA
206	212	Falcon Oil & Gas Co. Inc. ¹⁰	12,992	215	3,319	157	715	186	8,771	203	858
207	216	Prima Energy Corp. ²⁵	12,981	183	8,146	128	1,506	182	9,744	165	2,432
208	—	Mallin Resources Corp.	12,947	233	2,264	262	(1,355)	174	11,198	188	1,294
209	261	Partners Oil Co.	12,839	206	4,651	231	(205)	229	2,649	135	6,649
210	266	Southern Mineral Corp.	12,818	156	12,694	95	5,436	183	9,494	141	5,749
211	213	Home-State Royalty	12,810	189	7,146	136	1,194	176	10,668	144	5,470
212	211	Dorchester Hugoton Ltd.	12,661	196	6,087	116	2,475	175	¹¹ 11,197	232	436

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
135	0.206	157	1.920	146	1.675	143	25.12	130	0.206	154	1.920	142	1.675	139	25.12	—	0.000
170	0.108	152	2.003	128	2.456	146	24.16	166	0.108	150	2.003	124	2.456	141	24.16	135	2.916
252	0.016	192	0.860	262	0.103	198	9.626	249	0.016	187	0.860	259	0.103	192	9.626	—	0.000
227	0.033	145	2.187	208	0.470	134	29.58	224	0.033	143	2.187	201	0.470	129	29.58	137	2.300
179	0.088	277	0.031	120	3.304	281	0.116	266	0.008	278	0.031	286	0.021	281	0.116	—	0.000
129	0.233	133	2.849	121	3.066	128	34.72	126	0.233	131	2.849	114	3.066	123	34.72	35	62.000
152	0.153	206	0.607	118	3.421	179	14.21	146	0.153	201	0.607	112	3.421	174	14.21	—	0.000
120	0.259	158	1.888	126	2.514	165	18.41	117	0.259	155	1.888	122	2.514	162	18.41	98	9.100
250	0.016	202	0.682	255	0.128	153	22.45	250	0.016	197	0.682	253	0.128	148	22.45	84	12.160
124	0.243	127	3.146	158	1.343	164	16.61	121	0.243	126	3.146	150	1.343	161	16.61	202	0.010
277	0.004	250	0.105	281	0.036	236	2.746	276	0.004	251	0.105	279	0.036	234	2.746	—	NA
150	0.155	171	1.418	164	1.254	163	18.84	145	0.155	166	1.418	158	1.254	159	18.84	—	0.000
166	0.112	148	2.138	222	0.340	191	10.71	161	0.112	146	2.138	214	0.340	186	10.71	106	8.250
93	0.586	123	3.283	103	4.117	159	20.19	87	0.586	122	3.283	94	4.917	154	20.19	93	10.400
216	0.041	176	1.272	245	0.189	205	8.510	213	0.041	171	1.272	242	0.189	199	8.510	64	22.000
159	0.138	223	0.330	67	12.18	174	15.89	153	0.138	222	0.330	62	12.18	170	15.89	83	12.480
128	0.240	144	2.212	150	1.537	151	23.15	125	0.240	142	2.212	145	1.537	146	23.15	—	NA
207	0.053	191	0.893	213	0.426	193	10.37	221	0.034	219	0.398	223	0.292	219	3.750	148	1.250
165	0.117	189	0.925	209	0.458	221	4.116	160	0.117	185	0.925	202	0.458	216	4.116	183	0.270
220	0.038	262	0.065	263	0.102	277	0.248	217	0.038	263	0.065	260	0.102	277	0.248	—	0.000
112	0.387	169	1.468	130	2.408	210	7.343	109	0.387	165	1.468	126	2.408	205	7.343	194	0.120
133	0.229	180	1.172	93	5.974	101	60.75	129	0.229	175	1.172	84	5.974	94	60.75	—	NA
212	0.046	201	0.684	189	0.768	127	34.83	209	0.046	196	0.684	183	0.768	122	34.83	184	0.250
238	0.027	226	0.315	153	1.517	185	11.94	271	0.007	225	0.315	230	0.225	180	11.94	—	0.000
177	0.092	220	0.401	125	2.525	154	22.41	173	0.092	218	0.401	121	2.525	149	22.41	—	0.000
190	0.073	91	6.706	266	0.083	177	15.34	184	0.073	89	6.706	263	0.083	173	15.34	—	NA
163	0.122	132	2.999	195	0.673	176	15.68	158	0.122	130	2.999	264	0.079	172	15.68	159	0.900
182	0.081	177	1.267	210	0.446	138	26.73	177	0.081	172	1.267	203	0.446	134	26.73	—	0.000
229	0.032	205	0.613	252	0.135	226	3.580	228	0.032	200	0.613	250	0.135	222	3.580	—	NA
155	0.151	182	1.024	119	3.370	141	25.51	149	0.151	178	1.024	113	3.370	137	25.51	192	0.140
171	0.099	209	0.576	133	2.212	166	17.68	167	0.099	204	0.576	130	2.212	163	17.68	171	0.660
199	0.063	181	1.102	201	0.605	133	29.73	196	0.063	177	1.102	195	0.605	128	29.73	—	0.000
153	0.152	165	1.578	142	1.829	170	16.55	148	0.152	162	1.578	137	1.829	167	16.55	166	0.757
146	0.167	146	2.177	141	1.895	145	24.47	165	0.109	207	0.540	149	1.369	203	7.495	186	0.230
132	0.230	167	1.533	147	1.607	178	14.35	157	0.125	214	0.439	157	1.275	232	3.207	179	0.360
172	0.098	207	0.592	196	0.668	209	7.438	170	0.098	202	0.592	189	0.668	204	7.438	107	7.660
210	0.050	188	0.930	207	0.474	142	25.33	205	0.050	184	0.930	200	0.474	138	25.33	—	0.000
181	0.153	137	2.493	177	0.937	169	16.91	147	0.153	135	2.493	171	0.937	166	16.91	146	1.412
237	0.027	232	0.227	258	0.121	253	1.067	235	0.027	232	0.227	255	0.121	251	1.067	122	4.680
180	0.083	183	1.020	174	1.014	184	12.30	175	0.083	179	1.020	166	1.014	179	12.30	125	4.306
189	0.073	190	0.893	143	1.795	196	10.06	185	0.073	186	0.893	138	1.795	190	10.06	85	11.750
136	0.205	222	0.333	191	0.712	231	3.392	131	0.205	221	0.333	185	0.712	227	3.392	102	8.775
149	0.156	185	0.983	148	1.561	208	7.616	144	0.156	181	0.983	143	1.561	202	7.616	174	0.500
256	0.015	162	1.658	278	0.056	202	8.741	253	0.015	158	1.658	276	0.056	196	8.741	180	0.330
204	0.058	194	0.808	215	0.419	215	5.626	201	0.058	188	0.808	207	0.419	210	5.626	181	0.300
107	0.451	168	1.523	106	4.294	200	8.970	103	0.451	164	1.523	97	4.294	194	8.970	182	0.300
196	0.068	186	0.945	194	0.690	152	22.74	192	0.068	182	0.945	188	0.690	147	22.74	169	0.720
206	0.054	196	0.794	166	1.156	161	19.87	203	0.054	190	0.794	160	1.156	156	19.87	112	6.670
209	0.050	204	0.643	212	0.427	175	15.72	206	0.050	199	0.643	205	0.427	171	15.72	136	2.520
265	0.010	135	2.769	256	0.127	167	17.01	263	0.010	133	2.769	254	0.127	164	17.01	177	0.450
208	0.055	199	0.748	237	0.211	251	1.178	202	0.055	194	0.748	233	0.211	249	1.178	124	4.404
148	0.158	161	1.665	175	0.974	188	11.24	143	0.158	157	1.665	168	0.974	183	11.24	127	4.040
—	0	86	8.802	—	0	78	129.9	—	0	83	8.802	—	0	72	129.9	—	NA

Rank by total assets		Company	Total assets \$000	Total revenue \$000		Net income \$000		Stockholders' equity \$000		Capital & expl. spending \$000	
1990	1989			Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
213	203	Thor Energy Resources Inc. ¹⁰	11,415	203	4,879	189	130	191	8,023	210	749
214	217	Sabine Royalty Trust	10,913	127	24,484	58	¹³ 23,342	177	¹⁴ 10,358	—	0
215	222	Bellweher Exploration Co. ²⁴	10,694	216	3,281	168	504	181	9,950	184	1,486
216	228	Permian Basin Royalty Trust	9,835	126	25,210	56	¹³ 24,800	201	¹⁴ 5,930	171	1,900
217	—	Espero Energy Corp.	9,257	181	8,409	143	957	236	1,910	185	1,378
218	227	Credo Petroleum Corp. ⁴¹	9,202	239	1,916	180	280	188	8,250	206	848
219	229	Home-Stake Oil & Gas	8,862	193	6,366	155	723	192	7,592	151	4,898
220	226	Columbian Energy Co. L.P. ⁷	8,664	229	2,412	249	(521)	190	8,136	229	470
221	—	Xplor Corp.	8,616	230	2,388	196	44	199	5,982	236	420
222	224	Osceola Oil & Gas Corp. ⁵⁵	8,373	243	1,829	182	213	290	(9,701)	231	449
223	312	Search Exploration Inc. ^{7,56}	8,174	232	2,317	181	250	195	6,597	186	1,375
224	275	Parallel Petroleum Corp.	7,361	226	2,587	141	1,009	212	4,349	161	2,682
225	—	Chippewa Resources Corp.	7,338	254	1,295	159	655	222	3,454	159	3,523
226	239	Habersham Energy Co.	7,280	235	2,173	206	10	202	5,885	213	668
227	240	Panhandle Royalty Co. ⁷	7,256	222	2,830	167	518	204	5,647	205	848
228	238	Greenwood Holdings Inc.	7,215	241	1,895	232	(214)	194	6,607	234	431
229	280	Questa Oil & Gas Co.	7,049	240	1,902	153	788	228	2,703	178	1,689
230	258	Magic Circle Energy Corp.	6,745	218	3,214	162	602	205	5,343	197	1,024
231	250	GeoResources Inc.	6,674	219	3,086	165	565	210	4,586	222	507
232	237	Omni Exploration Inc. ⁷	6,471	231	2,322	224	(148)	211	4,458	253	227
233	252	Reserve Petroleum Co.	6,344	238	2,015	170	428	203	5,838	217	615
234	317	Intramex Corp. ⁵⁷	5,877	248	1,544	197	42	230	2,648	224	504
235	264	Pyramid Oil Co.	5,836	212	3,793	222	(121)	208	4,719	212	715
236	271	Oxford Consolidated Inc. ⁴⁵	5,558	224	2,746	164	590	209	4,703	196	1,051
237	253	Churchill Technology Inc.	5,554	252	1,394	183	202	218	3,821	252	238
238	293	BT Energy Corp.	5,272	220	2,906	207	7	243	1,543	202	859
239	272	Roxana Resources Ltd. ⁴⁴	4,773	287	295	220	(79)	216	4,130	280	24
240	284	Hawks Industries Inc.	4,764	209	4,380	171	411	225	3,259	207	847
241	279	Woodbine Petroleum Inc. ^{25,35}	4,679	250	1,483	175	349	221	3,564	221	515
242	251	Gulf Exploration Consultants Inc.	4,675	263	1,013	217	(72)	253	1,004	257	175
243	291	Great Eastern Energy & Development Corp.	4,657	227	2,511	163	594	215	4,144	194	1,101
244	255	Cobb Resources Corp. ²⁵	4,607	228	2,506	191	127	223	3,355	227	493
245	—	Fortune Petroleum Corp.	4,553	256	1,265	208	6	227	2,986	269	111
246	270	United Trans-Western Inc.	4,259	225	2,670	243	(339)	284	(292)	192	1,165
247	282	Amber Resources Co.	4,186	242	1,868	176	317	285	(1,141)	241	343
248	268	Sage Drilling Co. ²¹	4,101	210	4,264	255	(828)	252	1,006	261	159
249	319	Exploration Co. ³⁴	4,054	296	98	252	(571)	231	2,605	—	0
250	283	International Basic Resources Inc. ²⁵	3,975	291	192	238	(246)	246	1,288	263	144
251	294	Toreador Royalty Corp.	3,832	255	1,279	200	36	219	3,688	187	1,302
252	288	Basic Earth Science Systems Inc. ⁴⁶	3,529	245	1,722	193	70	235	1,938	230	453
253	295	Tyrex Oil Co. ²⁵	3,214	251	1,449	237	(245)	226	3,008	198	921
254	298	Pioneer Oil & Gas ⁷	3,080	234	2,221	173	374	232	2,233	214	660
255	308	Foreland Corp.	2,956	276	458	261	(1,305)	263	703	276	44
256	307	Chaparral Resources Inc. ³⁴	2,950	269	759	195	67	234	2,125	240	356
257	303	Vineyard Oil & Gas Co.	2,948	293	1,144	233	(216)	282	(254)	286	7
258	309	Tatum Petroleum Corp. ²⁵	2,458	282	1,050	226	(184)	233	2,201	264	144
259	306	Robson Petroleum Ltd.	2,219	258	1,175	211	(13)	237	1,853	223	506
260	345	Willard Pease Oil & Gas Co.	2,068	279	428	227	(190)	244	1,511	249	283
261	327	Sheffield Exploration Co. ²⁵	1,989	261	1,060	225	(171)	241	1,588	219	578
262	349	Big Piney Oil & Gas Co.	1,897	280	421	247	(417)	240	1,611	201	871
263	339	Double Eagle Petroleum and Mining Co. ¹⁹	1,854	266	788	190	130	238	1,757	233	436
264	332	Petrol Industries Inc.	1,844	246	1,614	198	37	239	1,716	262	155
265	231	Striker Petroleum Corp.	1,816	253	1,339	278	(5,922)	280	0	278	39

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
186	0.075	184	1.007	205	0.483	197	9.958	181	0.075	180	1.007	198	0.483	191	9.958	—	0.000
86	0.728	93	6.367	91	6.200	121	38.54	77	0.728	92	6.367	82	6.200	117	38.54	—	0.000
192	0.072	197	0.792	200	0.610	203	8.693	187	0.072	191	0.792	193	0.610	197	8.693	—	NA
75	0.966	130	3.115	58	16.61	108	49.96	69	0.966	128	3.115	51	16.61	102	49.96	—	0.000
147	0.165	150	2.075	181	0.834	213	6.327	142	0.165	148	2.075	175	0.834	208	6.327	150	1.040
217	0.040	224	0.326	220	0.358	227	3.566	214	0.040	223	0.326	212	0.358	223	3.566	163	0.831
156	0.145	166	1.559	176	0.949	192	10.45	150	0.145	163	1.559	169	0.949	188	10.45	126	4.040
195	0.069	210	0.563	198	0.631	220	4.134	191	0.069	205	0.563	191	0.631	215	4.134	—	NA
221	0.037	219	0.419	234	0.238	216	5.419	218	0.037	217	0.419	229	0.238	211	5.419	156	0.970
191	0.072	259	0.071	170	1.061	235	2.871	188	0.072	260	0.071	164	1.061	233	2.871	133	3.000
211	0.046	198	0.762	217	0.387	199	9.119	208	0.046	193	0.762	209	0.387	193	9.119	—	0.000
202	0.060	212	0.532	186	0.780	201	8.961	199	0.060	208	0.532	180	0.780	195	8.961	—	NA
233	0.031	278	0.031	117	3.475	232	3.359	230	0.031	277	0.031	111	3.475	228	3.359	130	3.550
197	0.067	218	0.435	197	0.667	230	3.408	193	0.067	216	0.435	190	0.667	226	3.408	144	1.696
223	0.035	179	1.176	251	0.152	211	6.630	220	0.035	174	1.176	249	0.152	206	6.630	164	0.821
219	0.039	228	0.307	248	0.163	245	1.527	215	0.039	227	0.307	246	0.163	243	1.527	168	0.735
246	0.019	216	0.448	226	0.309	229	3.513	244	0.019	213	0.448	218	0.309	225	3.513	114	6.360
200	0.062	200	0.747	223	0.333	225	3.711	197	0.062	195	0.747	215	0.333	221	3.711	161	0.890
174	0.098	287	0.007	167	1.113	279	0.219	168	0.098	288	0.007	161	1.113	279	0.219	153	1.000
185	0.077	214	0.467	140	1.964	137	27.49	180	0.077	211	0.467	136	1.964	133	27.49	199	0.040
264	0.011	227	0.308	271	0.071	243	1.674	262	0.011	226	0.308	269	0.071	241	1.674	158	0.910
286	0.002	275	0.033	242	0.194	256	0.747	285	0.002	275	0.033	239	0.194	255	0.747	—	0.000
167	0.112	279	0.021	193	0.695	285	0.094	163	0.112	280	0.021	187	0.695	285	0.094	132	3.000
169	0.110	239	0.151	161	1.334	254	1.038	164	0.110	240	0.151	153	1.334	252	1.038	173	0.500
235	0.029	231	0.227	187	0.779	214	5.748	233	0.029	231	0.227	181	0.779	209	5.748	139	2.060
224	0.034	215	0.449	236	0.222	241	2.031	222	0.034	212	0.449	232	0.222	239	2.031	—	NA
280	0.004	—	0	216	0.392	—	0	275	0.004	—	0	208	0.392	—	0	151	1.000
230	0.032	270	0.043	192	0.710	248	1.484	227	0.032	270	0.043	186	0.710	246	1.484	189	0.211
234	0.030	233	0.220	231	0.282	233	3.316	232	0.030	233	0.220	225	0.282	229	3.316	157	0.968
—	0	208	0.578	296	(s)	288	0.073	—	0	203	0.578	297	(s)	288	0.073	—	0.000
194	0.071	246	0.121	218	0.381	187	11.34	189	0.071	247	0.121	210	0.381	182	11.34	52	35.000
193	0.071	238	0.156	151	1.524	224	3.732	190	0.071	239	0.156	146	1.524	220	3.732	176	0.460
213	0.046	267	0.048	137	1.982	239	2.622	210	0.046	268	0.048	133	1.982	237	2.622	—	0.000
232	0.031	178	1.185	253	0.134	218	4.453	229	0.031	173	1.185	251	0.134	213	4.453	141	1.813
275	0.005	173	1.351	114	3.759	186	11.58	273	0.005	168	1.351	108	3.759	181	11.58	200	0.039
263	0.012	236	0.182	269	0.075	255	0.804	261	0.012	237	0.182	267	0.075	253	0.804	175	0.468
285	0.002	285	0.012	291	0.005	291	0.041	286	0.002	286	0.012	290	0.005	292	0.041	—	0.000
—	0	263	0.056	—	0	247	1.521	—	0	264	0.056	—	0	245	1.521	—	0.000
242	0.023	248	0.107	239	0.206	260	0.600	239	0.023	249	0.107	235	0.206	259	0.600	—	0.000
184	0.079	235	0.210	199	0.615	237	2.724	179	0.079	236	0.210	192	0.615	235	2.724	149	1.050
187	0.075	258	0.071	211	0.445	259	0.618	182	0.075	259	0.071	204	0.445	258	0.618	201	0.030
201	0.061	244	0.130	230	0.289	160	20.06	198	0.061	245	0.130	224	0.289	155	20.06	—	NA
244	0.021	—	0	203	0.542	—	0	240	0.021	—	0	196	0.542	—	0	172	0.600
241	0.023	247	0.119	206	0.476	223	3.905	238	0.023	248	0.119	199	0.476	218	3.905	191	0.180
289	0.002	241	0.146	293	0.003	262	0.540	289	0.002	242	0.146	294	0.003	262	0.540	—	0.000
254	0.015	242	0.144	221	0.345	228	3.527	255	0.015	243	0.144	213	0.345	224	3.527	140	2.000
243	0.022	234	0.212	172	1.041	212	6.467	247	0.017	235	0.212	167	1.011	207	6.465	—	NA
258	0.013	273	0.036	139	1.969	222	3.991	256	0.013	273	0.036	135	1.969	217	3.991	—	0.000
215	0.042	257	0.078	238	0.208	275	0.278	211	0.042	258	0.078	234	0.208	274	0.278	162	0.852
281	0.004	243	0.140	259	0.120	238	2.665	278	0.004	244	0.140	256	0.120	236	2.665	154	1.000
240	0.024	249	0.106	247	0.166	242	1.675	237	0.024	250	0.106	245	0.166	240	1.675	—	0.000
188	0.073	—	0	95	5.815	—	0	186	0.073	—	0	85	5.815	—	0	128	4.000
214	0.042	221	0.358	241	0.200	249	1.250	212	0.042	220	0.358	236	0.200	247	1.250	—	0.000

Rank by total assets		Company	Total assets \$000		Total revenue \$000		Net income \$000		Stockholders' equity \$000		Capital & expl. spending \$000	
1990	1989			Rank		Rank		Rank		Rank		
266	362	Texas Vanguard Oil Co.	1,751	257	1,194	177	315	249	1,156	228	485	
267	326	Ratex Resources Inc.	1,677	260	1,088	216	(61)	257	864	265	131	
268	344	Nova Natural Resources Corp. ⁷	1,643	272	618	199	37	242	1,551	258	169	
269	—	Pan American Energy Corp. ^{25,59}	1,634	299	58	184	191	269	474	279	29	
270	321	Altex Industries Inc. ⁷	1,613	264	914	248	(468)	247	1,271	235	429	
271	300	Kimco Energy Corp. ²⁵	1,537	273	583	258	(1,002)	259	746	256	181	
272	346	Imperial Petroleum Inc. ⁴⁰	1,500	298	66	214	(39)	250	1,147	—	0	
273	341	Golden Triangle Royalty & Oil Inc.	1,469	282	386	230	(200)	245	1,353	285	8	
274	360	Aspen Exploration Corp. ²⁵	1,397	267	788	194	58	248	1,211	248	284	
275	359	Tri-Valley Corp. ⁶⁰	1,375	268	762	245	(353)	261	725	245	315	
276	338	Sharon Energy Ltd. ⁴⁶	1,305	244	1,778	172	396	272	353	251	246	
277	352	Hughes Texas Petroleum Corp.	1,213	274	509	223	(136)	281	(14)	274	53	
278	367	DOL Resources, Inc.	1,201	295	121	201	29	266	629	—	0	
279	381	South Texas Drilling & Exploration Inc. ⁴⁶	1,159	223	2,784	236	(237)	273	343	238	584	
280	392	Great Northern Gas Co.	1,102	286	267	218	(76)	255	982	226	494	
281	379	Eagle Exploration Co. ⁴⁶	1,100	265	801	185	191	254	982	267	123	
282	354	Pantepec International Inc.	1,080	285	270	241	(314)	251	1,064	—	0	
283	366	TPEX Exploration Inc. ²⁵	1,078	271	633	209	0	270	468	273	54	
284	382	General Energy Resources & Technology Corp.	984	270	643	192	95	271	392	242	339	
285	376	Minez Resources Inc. ⁵³	963	297	67	215	(44)	258	829	281	24	
286	394	Triumph Oil & Gas Corp. ²⁵	962	247	1,591	228	(192)	283	(274)	254	214	
287	391	National Petroleum Corp. Ltd. ⁵³	933	277	442	203	23	278	59	282	21	
288	387	Morrison Nuclear Inc.	895	249	1,542	134	1,288	287	(1,647)	—	0	
289	384	Amacan Resources Corp. ⁶¹	837	289	220	212	(16)	260	730	270	93	
290	385	Wyoming Oil & Minerals Inc. ⁴⁵	830	290	215	204	23	267	526	—	0	
291	378	Camelot Corp. ⁶¹	827	288	253	234	(222)	268	490	250	264	
292	368	Taurus Petroleum Inc. ⁷	819	281	389	239	(298)	264	647	284	10	
293	372	Western Energy Resources Inc.	730	292	177	240	(302)	262	718	—	0	
294	389	Lynx Exploration Co. ⁷	717	275	470	210	(2)	274	294	288	2	
295	396	Maxco Energy Corp. ⁴⁵	658	284	275	202	27	265	640	271	70	
296	398	Sooner Energy Corp.	498	283	358	213	(19)	275	253	277	41	
297	358	Reserve Exploration Co. ⁴⁶	458	278	440	242	(333)	277	67	283	21	
298	—	International Royalty & Oil Co. ⁷	194	294	129	250	(530)	286	(1,314)	275	46	
299	—	PXA Onshore Corp. ⁴⁵	141	293	157	205	20	276	129	287	5	
300	—	Paloma Petroleum Ltd.	71	300	36	221	(82)	279	24	—	0	
Totals			499,344,267		536,548,399		23,237,910		170,669,135		56,195,875	

NA = Not Available. (s) indicates less than 500 bbl or 500 mcf. Fiscal yearend is Dec. 31 unless otherwise noted. 1. One of Royal Dutch Shell group of companies, owned 60% by Royal Dutch Petroleum, The Netherlands, and 40% by The "Shell" Transport and Trading Co. plc, England. 2. Subsidiary of British Petroleum Co. plc, England. 3. Operating income before tax. 4. Subsidiary of USX. 5. Subsidiary of E.I. du Pont de Nemours. 6. After-tax operating income. 7. Fiscal yearend September 30. 8. Subsidiary of Burlington Resources. 9. Affiliated with and majority owned by Petrofina, S.A., Belgium. Changed name to Fina Inc. since fiscal yearend. 10. Fiscal yearend January 31, 1991. 11. Partners' capital. 12. Subsidiary of Union Pacific.

13. Include storage. 14. Contain an insignificant amount of Canadian data. 15. Subsidiary of Pacific Enterprises. 16. Include cost-of-service and non-cost-of-service. 17. Enserch Corp. owns 99.2%. 18. Indirect subsidiary of Public Service Enterprise Group Inc. 19. Fiscal yearend August 31. 20. W.R. Grace owns 83.4%. 21. Subsidiary of AMAX Inc. 22. Subsidiary of Nerco Inc. 23. Subsidiary of Broken Hill Proprietary. 24. Fiscal yearend May 31. 25. Fiscal yearend June 30. 26. Members' equity. 27. Subsidiary of CMS Enterprises Co. 28. Formerly Pauley Petroleum. 29. Became public March 1990 after acquiring Snyder Oil Partners L.P. 30. Maxus Energy Corp. owns 86%. 31. Formerly Parker & Parsley Development Partners LP.

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
231	0.031	254	0.091	173	1.039	234	3.222	231	0.031	255	0.091	165	1.039	230	3.222	97	9.180
239	0.027	225	0.325	260	0.107	246	1.526	236	0.027	224	0.325	257	0.107	244	1.526	188	0.212
259	0.013	261	0.066	274	0.065	269	0.379	257	0.013	262	0.066	271	0.065	268	0.379	193	0.120
269	0.008	290	0.002	279	0.049	295	0.010	267	0.008	291	0.002	277	0.049	294	0.010	—	0.000
225	0.034	272	0.040	227	0.303	265	0.438	223	0.034	272	0.040	220	0.303	265	0.438	195	0.100
253	0.015	266	0.048	265	0.085	293	0.032	251	0.015	267	0.048	262	0.085	293	0.032	—	NA
283	0.003	291	0.001	264	0.101	286	0.089	281	0.003	292	0.001	261	0.101	286	0.089	—	0.000
292	0.001	288	0.005	290	0.005	292	0.041	293	0.001	289	0.005	291	0.005	291	0.041	—	0.000
245	0.019	281	0.019	244	0.190	268	0.387	245	0.019	282	0.019	241	0.190	267	0.387	—	NA
—	0	268	0.047	295	0.002	264	0.441	—	0	269	0.047	296	0.002	264	0.441	155	1.000
222	0.036	274	0.034	261	0.106	270	0.377	219	0.036	274	0.034	258	0.106	269	0.377	—	NA
251	0.016	253	0.092	229	0.301	273	0.336	248	0.016	254	0.092	221	0.301	272	0.336	—	0.000
287	0.002	283	0.017	282	0.034	284	0.098	288	0.002	284	0.017	280	0.034	284	0.098	—	0.000
274	0.005	289	0.003	285	0.026	294	0.010	274	0.005	290	0.003	282	0.026	295	0.010	185	0.250
293	(s)	237	0.177	—	0	171	16.51	294	(s)	238	0.177	—	0	168	16.51	—	0.000
262	0.012	230	0.285	286	0.025	280	0.130	260	0.012	229	0.285	284	0.025	280	0.130	165	0.791
284	0.003	252	0.099	289	0.019	258	0.664	283	0.003	253	0.099	289	0.019	257	0.664	—	0.000
226	0.033	264	0.052	228	0.301	271	0.374	225	0.033	265	0.052	222	0.301	270	0.374	—	0.000
261	0.012	256	0.080	268	0.076	244	1.622	259	0.012	257	0.080	266	0.076	242	1.622	178	0.360
288	0.002	292	0.001	275	0.065	287	0.088	287	0.002	293	0.001	272	0.065	287	0.088	—	0.000
276	0.004	284	0.013	284	0.026	282	0.114	277	0.004	285	0.013	283	0.026	282	0.114	198	0.071
267	0.009	269	0.047	257	0.125	266	0.424	284	0.002	279	0.030	285	0.022	275	0.270	—	0.000
218	0.039	—	0	254	0.132	—	0	216	0.039	—	0	252	0.132	—	0	—	0.000
270	0.008	255	0.082	270	0.071	267	0.421	268	0.008	256	0.082	268	0.071	266	0.421	197	0.073
271	0.007	282	0.018	267	0.078	257	0.727	272	0.007	283	0.018	265	0.078	256	0.727	—	0.000
290	0.001	260	0.071	292	0.004	250	1.198	290	0.001	261	0.071	292	0.004	248	1.198	—	0.000
266	0.009	251	0.102	277	0.060	252	1.161	264	0.009	252	0.102	275	0.060	250	1.161	—	0.000
279	0.004	265	0.050	272	0.070	263	0.445	280	0.004	266	0.050	270	0.070	263	0.445	—	0.000
257	0.015	280	0.020	214	0.420	272	0.371	254	0.015	281	0.020	206	0.420	271	0.371	—	0.000
268	0.008	271	0.041	276	0.062	274	0.304	265	0.008	271	0.041	274	0.062	273	0.304	—	NA
278	0.004	245	0.123	287	0.020	261	0.598	279	0.004	246	0.123	287	0.020	260	0.598	196	0.090
249	0.017	276	0.032	280	0.047	283	0.107	246	0.017	276	0.032	278	0.047	283	0.107	—	NA
282	0.003	—	0	273	0.065	289	0.059	282	0.003	—	0	273	0.065	289	0.059	—	0.000
—	0	—	0	283	0.029	278	0.223	—	0	—	0	281	0.029	278	0.223	—	NA
291	0.001	286	0.010	294	0.002	290	0.057	291	0.001	287	0.010	295	0.002	290	0.057	—	0.000
3,092		14,132		31,851		165,103		2,029		10,625		21,906		113,800		10,870	

32. Subsidiary of Brooklyn Union Gas Co. 33. Distributable cash. 34. Trust corpus. 35. Data reflects 9 months due to fiscal yearend change. 36. Dominant line of business is contract gas compression and processing, and EOR. 37. Subsidiary of Public Service Co. of Colorado. 38. Coho Resources Ltd. owns 67.5%. 39. Subsidiary of Washington Energy Co., formerly listed as Thermal Exploration. 40. Operating income before overhead and interest. 41. Subsidiary of Energen Co. 42. Subsidiary of Chicago Bridge & Iron. 43. Apache Corp. owns 4%. 44. Subsidiary of MDU Resources Group Inc. 45. Fiscal yearend February 28, 1991. 46. Fiscal yearend March 31. 47. Subsidiary of Penn Virginia Corp. 48. Subsidiary of Deminex Deutsche Erdölversor-

gungsgesellschaft mbH. 49. Fiscal yearend October 31. 50. Fiscal yearend March 31, 1991. 51. Formerly Petroleum Investments Ltd. 52. Formerly ZG Energy, which merged with Burkhart Petroleum. 53. Fiscal yearend November 30. 54. Formerly K.R.M. Petroleum Corp. 55. Subsidiary of Aminex plc. Formerly listed as Eglinton Oil & Gas. 56. Formerly Plano Petroleum Corp. 57. Formerly Intramex Oil & Minerals Inc. 58. U.S. operating subsidiary of Roxana Resources Ltd. Canada. 59. Formerly Supreme Oil & Gas. Data reflects 10 months due to fiscal yearend change. 60. Fiscal yearend July 31. 61. Fiscal yearend April 30.

The OGJ300 Company Index

Rank by total assets	Company	Headquarters city
188	Adams Resources & Energy Inc.	Houston
63	Adobe Resources Corp.	New York
163	Alamco Inc.	Clarksburg, W.Va.
161	Alexander Energy Corp.	Oklahoma City
88	Allegheny & Western Energy Corp.	Charleston, W.Va.
190	Alta Energy Corp.	Midland, Tex.
270	Altex Industries Inc.	Denver
289	Amacan Resources Corp.	Salt Lake City, Utah
52	AMAX Oil & Gas Inc.	Houston
247	Amber Resources Co.	Denver
16	Amerada Hess Corp.	New York
94	American Exploration Co.	Houston
163	American International Petroleum Corp.	New York
155	American National Petroleum Co.	Houston
29	American Petrofina Inc.	Dallas
4	Amoco Corp.	Chicago
38	Anadarko Petroleum Corp.	Houston
53	Apache Corp.	Denver
132	Apache Offshore Investment Partnership	Denver
181	Arch Petroleum Inc.	Fort Worth
7	ARCO	Los Angeles
21	Arkia Inc.	Shreveport, La.
20	Ashland Oil Inc.	Ashland, Ky.
274	Aspen Exploration Corp.	Denver
139	Barrett Resources Corp.	Denver
252	Basic Earth Science Systems Inc.	Englewood, Colo.
98	Beard Oil Co.	Oklahoma City
179	Belcor Inc.	Irvine, Calif.
167	Belden & Blake Energy Co.	North Canton, Ohio
215	Bellwether Exploration Co.	Houston
175	Benton Oil & Gas Co.	Ventura, Calif.
99	Berry Petroleum Co.	Taft, Calif.
56	BHP Petroleum (Americas) Inc.	Houston
262	Big Piney Oil & Gas Co.	Atlanta
182	Blue Dolphin Energy Co.	Houston
9	BP (USA)	Cleveland
186	Bradmar Petroleum Corp.	Oklahoma City
197	Brock Exploration Corp.	New Orleans
238	BT Energy Corp.	Independence, Ohio
109	Buttes Gas & Oil Co.	Houston
37	Cabot Corp.	Waltham, Mass.
180	Callon Consolidated Partners LP	Natchez, Miss.
291	Camelot Corp.	Dallas
106	Castle Energy Corp.	Blue Bell, Pa.
55	Cenex, Farmer's Union Central Exchange Inc.	St. Paul
256	Chaparral Resources Inc.	Denver
3	Chevron Corp.	San Francisco
96	Chieftain International	Edmonton
225	Chippewa Resources Corp.	Denver
237	Churchill Technology Inc.	Lakewood, Colo.
101	Cliffs Drilling Co.	Houston
15	Coastal Corp.	Houston
244	Cobb Resources Corp.	Albuquerque
169	Coda Energy Inc.	Dallas
118	Coho Resources Inc.	Dallas
17	Columbia Gas System Inc.	Wilmington, Del.
220	Columbian Energy Co. LP	Topeka, Kan.
193	Columbus Energy Corp.	Denver
152	Comstock Resources Inc.	Dallas
12	Conoco Inc.	Houston
95	Conquest Exploration Co.	Houston
22	Consolidated Natural Gas Co.	Pittsburgh
158	Convast Energy Corp.	Houston
218	Credo Petroleum Corp.	Denver
110	Crystal Oil Co.	Shreveport, La.
122	Damson Oil Corp.	New York
61	Dekalb Energy Co.	Denver
173	Deminex U.S. Oil Co.	Dallas
102	Devon Energy Corp.	Oklahoma City

Rank by total assets	Company	Headquarters city
150	DI Industries Inc.	Houston
83	Diamond Shamrock Offshore Partners LP	Dallas
278	DOL Resources Inc.	Dallas
212	Dorchester Hugoton Ltd.	Dallas
263	Double Eagle Petroleum & Mining Co.	Casper, Wyo.
281	Eagle Exploration Co.	Denver
67	Edisto Resources Corp.	Dallas
47	Energy Development Corp.	Houston
91	Energy Ventures Inc.	Houston
178	Enex Resources Corp.	Kingwood, Tex.
13	Enron Corp.	Houston
27	Enserch Corp.	Dallas
45	Enserch Exploration Partners Ltd.	Dallas
43	Equitable Resources Inc.	Pittsburgh
133	Equity Oil Co.	Salt Lake City, Utah
217	Espero Energy Corp.	San Antonio
184	Evergreen Resources Inc.	Denver
249	Exploration Co.	San Antonio
92	Exploration Co. of Louisiana Inc.	Lafayette, La.
1	Exxon Corp.	Irving, Tex.
206	Falcon Oil & Gas Co. Inc.	Odessa, Tex.
144	Fidelity Oil Group	Bismarck, N.D.
64	First Mississippi Corp.	Jackson, Miss.
255	Foreland Corp.	Ogden, Utah
74	Forest Oil Corp.	Denver
245	Fortune Petroleum Corp.	Agoura Hills, Calif.
24	Freeport-McMoRan Inc.	New Orleans
185	Freeport-McMoRan Oil & Gas Royalty Trust	Houston
117	Fuel Resources Development Co.	Denver
108	Fuel Resources Inc.	Staten Island, N.Y.
164	Garnet Resources Corp.	Houston
284	General Energy Resources & Technology Corp.	Traverse City, Mich.
148	Geodyne Resources Inc.	Tulsa
231	GeoResources Inc.	Williston, N.D.
165	Gerrity Oil & Gas Corp.	Denver
80	Giant Industries	Scottsdale, Ariz.
62	Global Marine Inc.	Houston
90	Global Natural Resources Inc.	Houston
273	Golden Triangle Royalty & Oil Inc.	Cisco, Tex.
51	Grace Energy Corp.	Dallas
243	Great Eastern Energy & Development Corp.	Englewood, Colo.
280	Great Northern Gas Co.	Denver
228	Greenwood Holdings Inc.	Englewood, Colo.
242	Gulf Exploration Consultants Inc.	Houston
226	Habersham Energy Co.	Atlanta
82	Hadson Corp.	Oklahoma City
97	Hadson Energy Resources Corp.	Oklahoma City
176	Hallwood Energy Corp.	Denver
85	Hallwood Energy Partners LP	Denver
46	Hamilton Oil Corp.	Denver
194	HarCor Energy Inc.	Beverly Hills, Calif.
240	Hawks Industries Inc.	Casper, Wyo.
60	Helmerich & Payne Inc.	Tulsa
219	Home-Stake Oil & Gas	Tulsa
211	Home-Stake Royalty	Tulsa
79	Hondo Oil & Gas	Roswell, N.M.
94	Howell Corp.	Houston
277	Hughes Texas Petroleum Corp.	Hattiesburg, Miss.
272	Imperial Petroleum Inc.	Dallas
126	Integrated Drilling & Exploration Inc.	Tulsa
250	International Basic Resources Inc.	Spokane, Wash.
298	International Royalty & Oil Co.	Fort Worth

Rank by total assets	Company	Headquarters city
234	Intramerica Corp.	Irving, Tex.
140	KCS Group Inc.	Edison, N.J.
131	Kelley Oil Corp.	Houston
104	Kelley Oil & Gas Partners Ltd.	Houston
25	Kerr-McGee Corp.	Oklahoma City
130	Key Production Co. Inc.	Denver
271	Kimco Energy Corp.	Denver
205	LL & E Royalty Trust	Houston
204	Lomak Petroleum Inc.	Fort Worth
41	Louisiana Land & Exploration Co.	New Orleans
294	Lynx Exploration Co.	Denver
146	Magellan Petroleum Corp.	Hartford, Conn.
230	Magic Circle Energy Corp.	Oklahoma City
208	Mallin Resources Corp.	Denver
39	Maxus Energy Corp.	Dallas
141	Maynard Oil Co.	Dallas
151	McFarland Energy Inc.	Santa Fe Springs, Calif.
26	Meridian Oil Inc.	Houston
32	Mesa LP	Amesville, Tex.
295	Mexco Energy Corp.	Midland, Tex.
285	Minex Resources Inc.	Riverport, Wyo.
30	Mitchell Energy & Development Corp.	The Woodlands, Tex.
2	Mobil Corp.	Fairfax, Va.
36	Montana Power Co.	Butte, Mont.
288	Morrison Nuclear Inc.	Calgary
34	Murphy Oil Corp.	El Dorado, Ark.
200	Nahama & Weagant Energy Co.	Bakersfield, Calif.
75	National Cooperative Refinery Association	McPherson, Kan.
40	National Fuel Gas Co.	New York
287	National Petroleum Corp. Ltd.	Dallas
54	Nerco Oil & Gas Inc.	Portland, Ore.
157	New London Inc.	San Antonio
31	Nicor Inc.	Naperville, Ill.
59	Noble Affiliates Inc.	Ardmore, Okla.
78	Noble Drilling Corp.	Houston
76	Nomeco Oil & Gas Co.	Jackson, Mich.
77	Norcen Energy Resources Ltd. (U.S. Operations)	Calgary
268	Nova Natural Resources Corp.	Denver
87	Nucorp Inc.	Chicago
100	Nuevo Energy Co.	Houston
203	Oakridge Energy Inc.	Wichita Falls, Tex.
8	Occidental Petroleum Corp.	Los Angeles
50	Ocean Drilling & Exploration Co.	New Orleans
128	OKC Limited Partnership	Dallas
232	Omni Exploration Inc.	Columbus
48	Oneok Inc.	Tulsa
19	Oryx Energy Co.	Dallas
222	Oseola Oil & Gas Corp.	Fort Worth
236	Oxford Consolidated Inc.	Denver
42	Pacific Enterprises Oil & Gas Co.	Los Angeles
300	Paioma Petroleum Ltd.	Calgary
269	Pan American Energy Corp.	Fresno
199	Pan Petroleum MLP	Kansas City
227	Panhandle Royalty Co.	Oklahoma City
282	Pantepec International Inc.	Litchfield, Conn.
224	Parallel Petroleum Corp.	Midland, Tex.
86	Parker & Parsley Petroleum Co.	Midland, Tex.
209	Partners Oil Co.	Houston
121	Patrick Petroleum Co.	Jackson, Mich.
154	Penn Virginia Resources Corp.	Duffield, Va.
18	Pennzoil Co.	Houston
216	Permian Basin Royalty Trust	Fort Worth
264	Petrol Industries Inc.	Shreveport, La.
168	Petroleum Development Corp.	Bridgeport, W.Va.
10	Phillips Petroleum Co.	Bartlesville, Okla.
159	Phoenix Resource Companies Inc.	Oklahoma City
254	Pioneer Oil & Gas	Midvale, Utah
114	Plains Petroleum Co.	Lakewood, Colo.
113	Plains Resources Inc.	Houston

The OGI300 Company Index

Rank by total assets	Company	Headquarters city
170	Plexus Resources Corp.	Salt Lake City, Utah
66	Pogo Producing Co.	Houston
66	Presidio Oil Co.	Englewood, Colo.
207	Prime Energy Corp.	Denver
195	PrimeEnergy Corp.	Stamford, Conn.
116	Production Operators Corp.	Houston
162	Prudential-Bache Energy Growth Fund LP G-1	Covington, La.
191	Prudential-Bache Energy Income LP II P-10	Covington, La.
196	Prudential-Bache Energy Income LP II P-11	Covington, La.
187	Prudential-Bache Energy Income LP II P-8	Covington, La.
156	Prudential-Bache Energy Income LP III P-12	Covington, La.
171	Prudential-Bache Energy Income LP III P-13	Covington, La.
153	Prudential-Bache Energy Income LP III P-14	Covington, La.
160	Prudential-Bache Energy Income LP III P-15	Covington, La.
136	Prudential-Bache Energy Income LP IV P-16	Covington, La.
134	Prudential-Bache Energy Income LP IV P-17	Covington, La.
145	Prudential-Bache Energy Income LP V P-18	Covington, La.
127	Prudential-Bache Energy Income LP V P-19	Covington, La.
147	Prudential-Bache Energy Income LP V P-20	Covington, La.
125	Prudential-Bache Energy Income LP V P-21	Covington, La.
137	Prudential-Bache Energy Income LP V P-22	Covington, La.
142	Prudential-Bache Energy Income LP VI P-23	Covington, La.
143	Prudential-Bache Energy Income LP VI P-24	Covington, La.
119	Prudential-Bache Energy Income LP VI P-25	Covington, La.
299	PXA Onshore Corp.	Tulsa
235	Pyramid Oil Co.	Bakersfield, Calif.
229	Questa Oil & Gas Co.	Tulsa
44	Questar Corp.	Salt Lake City, Utah
267	Ratex Resources Inc.	Oklahoma City
172	Red Eagle Resources Corp.	Oklahoma City
297	Reserve Exploration Co.	Tulsa
233	Reserve Petroleum Co.	Oklahoma City
174	Resource America Inc.	Philadelphia
259	Robson Petroleum Ltd.	Tulsa
239	Roxana Resources Ltd.	Tulsa
214	Sabine Royalty Trust	Dallas
248	Sage Drilling Co.	Wichita
135	Sage Energy Co.	San Antonio
129	Samson Energy Co. LP	Tulsa
111	San Juan Basin Royalty Trust	Fort Worth
73	Santa Fe Energy Partners LP	Houston
49	Santa Fe Energy Resources Inc.	Houston
70	Seagull Energy Corp.	Houston
223	Search Exploration Inc.	Dallas
276	Sharon Energy Ltd.	Englewood, Colo.
261	Sheffield Exploration Co.	Denver
5	Shell Oil Co.	Houston
81	Snyder Oil Corp.	Fort Worth
28	Sonat Inc.	Birmingham
296	Sooner Energy Corp.	Oklahoma City
279	South Texas Drilling & Exploration Inc.	San Antonio
210	Southern Mineral Corp.	Houston
69	Southern Union Co.	Austin
71	Southwestern Energy Co.	Fayetteville, Ark.
265	Striker Petroleum Corp.	Denver
177	Sunlife Inc.	Alpharetta, Ga.

Rank by total assets	Company	Headquarters city
105	Swift Energy Co.	Houston
258	Tatum Petroleum Corp.	Yorba Linda, Calif.
123	Taurus Exploration Inc.	Birmingham
292	Taurus Petroleum Inc.	San Antonio
65	Tesoro Petroleum Corp.	San Antonio
6	Texaco Inc.	White Plains, N.Y.
149	Texas Meridian Resources Ltd.	Houston
266	Texas Vanguard Oil Co.	Austin
89	TGX Corp.	Shreveport, La.
213	Thor Energy Resources Inc.	Tyler, Tex.
201	Tide West Oil Co.	Holdenville, Okla.
189	Tipperary Corp.	Denver
112	Tom Brown Inc.	Midland, Tex.
251	Toreador Royalty Corp.	Dallas
283	TPEX Exploration Inc.	Denver
23	Transco Energy Co.	Houston
72	Tredegar Industries	Richmond
57	Triton Energy Corp.	Dallas
286	Triumph Oil & Gas Corp.	New York
275	Tri-Valley Corp.	Bakersfield, Calif.
198	Tucker Drilling Co. Inc.	San Angelo, Tex.
253	Tyrex Oil Co.	Casper, Wyo.
33	Union Pacific Resources Co.	Fort Worth
35	Union Texas Petroleum Holdings Inc.	Houston
115	Unit Corp.	Tulsa
246	United Trans-Western Inc.	Dallas
14	Unocal Corp.	Los Angeles
11	USX-Marathon Group	Houston
192	Vantage Point Energy	Tulsa
257	Vineyard Oil & Gas Co.	Northeast, Pa.
103	Vintage Petroleum	Tulsa
93	Wainoco Oil Corp.	Houston
120	Washington Energy Resources	Seattle
293	Western Energy Resources Inc.	Laguna Niguel, Calif.
202	Whiting Petroleum Corp.	Denver
166	Wichita River Oil Corp.	Denver
260	Willard Pease Oil & Gas Co.	Grand Junction, Colo.
138	Wilshire Oil Co. of Texas	Jersey City
107	Wiser Oil Co.	Sistersville, W. Va.
124	Wolverine Exploration Co.	Fort Worth
241	Woodbine Petroleum Inc.	Dallas
290	Wyoming Oil & Minerals Inc.	Casper, Wyo.
221	Xplor Corp.	New York
58	Zapata Corp.	Houston





State companies dominate non-U.S. OGJ100

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State owned oil and gas companies dominate the OGJ100 list of major non-U.S. holders of petroleum reserves.

Many state companies report only production and reserves information and do not report financial data. Therefore, the companies cannot be ranked by financial data, as they are in the OGJ300.

They instead are listed by region, based on location of companies' corporate head-

quarters.

The top 20 companies in crude oil production and reserves are shown (see table). The leading nongovernment company in both reserves and production is Royal Dutch/Shell Group—No. 11 in worldwide liquids reserves and No. 6 in liquids production.

Crude oil reserves of the top 20 companies moved up less than 1% last year, increasing 401.5 million bbl to 854.2 billion bbl. The year before, when there were substantial reserves adjustments, the top 20 posted an increase of 139.3 billion bbl.

The top 20 companies now control 85.5% of world

proved oil reserves. This is up slightly from 85.2% last year.

Major international oil companies with headquarters in the U.S. are not included in the OGJ100. Several would rank in the top 20.

Exxon would rank No. 9 in worldwide liquids production and No. 14 in worldwide liquids reserves.

Other U.S. companies that would make the list of top oil producers are Chevron No. 14, Amoco No. 16, Texaco No. 17, ARCO No. 18, and Mobil No. 20.

No other companies on the OGJ300 list would make the top 20 worldwide in terms of liquids reserves.

OGJ100: reserve and production leaders

Rank	Company	Reserves million bbl	Rank	Company	Production million bbl
1	Saudi Arabian Oil Co.	257,504.0	1	Saudi Arabian Oil Co.	2,284.0
2	Iraq National Oil Co.	100,000.0	2	National Iranian Oil Co.	1,144.8
3	Kuwait Petroleum Corp.	94,525.0	3	Petróleos Mexicanos	885.8
4	National Iranian Oil Co.	92,850.0	4	Petróleos de Venezuela SA	779.3
5	Abu Dhabi National Oil Co.	92,200.0	5	Iraq National Oil Co.	752.2
6	Petróleos de Venezuela SA	80,055.0	6	Royal Dutch/Shell (Netherlands)	692.0
7	Petróleos Mexicanos	51,298.0	7	Nigerian National Petroleum Corp.	680.5
8	National Oil Corp. (Libya)	22,800.0	8	Abu Dhabi National Oil Co.	585.7
9	Nigerian National Petroleum Corp.	17,899.8	9	Pertamina (Indonesia)	533.7
10	Pertamina (Indonesia)	10,728.8	10	National Oil Corp. (Libya)	501.5
11	Royal Dutch/Shell (Netherlands)	10,107.0	11	British Petroleum Co. plc (U.K.)	422.0
12	Sonatrach (Algeria)	9,200.0	12	Kuwait Petroleum Corp.	393.8
13	Oil & Natural Gas Commission (India)	7,997.1	13	Sonatrach (Algeria)	280.8
14	British Petroleum Co. plc (U.K.)	4,653.0	14	Oil & Natural Gas Commission (India)	243.1
15	Qatar General Petroleum Corp.	4,500.0	15	Petroleum Development Oman	242.4
16	Petroleum Development Oman	4,300.0	16	Petróleo Brasileiro SA (Brazil)	236.6
17	Dubai Petroleum Co.	4,000.0	17	Sté. Nat. Elf Aquitaine (France)	189.0
18	Total (France)	3,798.0	18	Ente Nazionale Idrocarburi (Italy)	178.9
19	Ente Nazionale Idrocarburi (Italy)	2,942.1	19	Yacimientos Petrolíferos Fiscales SA (Argentina)	174.8
20	Petróbras Brasileiro SA (Brazil)	2,800.2	20	Total (France)	162.8
Total		854,157.8	Total		11,498.2

Leading oil and gas companies around the world

Country	Company	Total assets		Total revenues		Total net income		Capital and exploratory expenditures	
		1990	1989	1990	1989	1990	1989	1990	1989
Million \$									
CANADA									
Canada	Alberta Energy Co. Ltd.....	2,416.0	2,319.5	656.3	599.0	62.5	44.2	259.1	231.9
Canada	Amoco Canada Petroleum Co. Ltd.....	7,328.5	7,789.7	5,205.1	4,093.1	(61.8)	(240.4)	432.9	521.0
Canada	Bow Valley Industries Ltd.....	1,742.1	1,501.7	525.1	427.1	58.0	30.4	219.1	229.7
Canada	Canadian Hunter Exploration Ltd.....	949.0	795.2	215.9	150.6	2.6	5.0	292.3	283.6
Canada	Canadian Northwest Energy Ltd.....	498.3	522.7	99.6	109.4	(19.2)	(8.4)	57.8	70.7
Canada	Canadian Occidental Petroleum Ltd.....	1,681.3	1,623.8	760.4	700.0	36.8	45.9	257.2	193.4
Canada	Canadian Western Natural Gas Co. Ltd.....	514.1	511.1	346.0	350.9	22.5	24.8	55.3	36.5
Canada	Chauvco Resources Ltd.....	218.1	108.5	93.0	31.0	18.3	5.3	141.9	25.9
Canada	Chevron Canada Resources	1,711.8	1,598.1	1,234.3	1,039.4	200.4	162.4	334.7	460.1
Canada	Co-enerco Resources Ltd.	258.0	246.5	46.7	37.3	1.6	0.3	34.4	17.8
Canada	Coho Resources Ltd.	208.8	172.9	57.6	45.2	11.7	3.0	70.4	51.0
Canada	Conwest Exploration Co. Ltd.....	474.0	441.5	120.3	122.1	9.1	12.2	149.9	56.8
Canada	Encor Inc.	1,620.9	1,708.8	366.4	376.5	(82.8)	(58.0)	130.7	104.4
Canada	Gulf Canada Resources Ltd.....	4,370.9	3,846.2	1,072.3	1,081.0	(26.8)	54.5	415.4	397.8
Canada	Home Oil Co. Ltd.	1,745.4	1,657.5	399.2	328.8	77.5	68.8	229.5	289.4
Canada	Husky Oil Operations.....	4,292.2	4,294.8	967.3	948.3	58.7	1.3	474.3	293.1
Canada	Imperial Oil Ltd.....	17,631.9	18,033.9	13,182.5	11,963.1	575.2	539.9	779.4	1,031.3
Canada	Interprovincial Pipe Line Inc.....	3,687.1	3,609.9	1,106.1	1,031.6	168.0	154.6	343.2	385.5
Canada	Mark Resources Inc.	607.6	579.6	107.6	89.0	4.2	0.5	87.4	76.5
Canada	Norcen Energy Resources Ltd.	3,484.3	3,023.4	1,227.7	1,000.6	150.7	130.5	549.8	777.2
Canada	North Canadian Oils Ltd.	1,285.6	1,168.2	189.3	162.4	36.4	33.2	290.8	137.7
Canada	Numac Oil & Gas Ltd.	402.9	376.8	61.3	51.5	5.5	2.2	40.9	77.7
Canada	PanCanadian Petroleum Ltd.	3,363.8	3,167.5	1,110.9	932.4	246.9	157.5	396.2	358.3
Canada	Petro-Canada.....	8,444.7	7,807.0	6,852.6	5,950.8	211.2	23.7	1,024.5	672.5
Canada	Poco Petroleums Ltd.....	602.3	517.0	115.9	85.9	13.1	9.7	79.9	56.1
Canada	Ranger Oil Ltd.	588.8	564.8	160.3	132.9	42.4	51.9	89.5	108.6
Canada	Renaissance Energy Ltd.	479.1	380.6	210.0	154.6	70.1	44.2	159.2	122.2
Canada	Saskatchewan Oil & Gas Corp.	1,462.9	1,323.0	402.9	268.5	17.2	39.7	278.0	180.2
Canada	Sceptre Resources Ltd.	860.3	893.7	223.6	190.1	13.2	(28.6)	74.1	88.9
Canada	Suncor Inc.	2,621.1	2,390.9	2,052.4	1,761.8	144.7	67.5	208.9	166.9
Canada	Union Energy Inc.	2,914.0	2,642.7	2,050.4	2,149.6	56.3	53.5	397.2	332.2
Canada	Westcoast Petroleum Ltd.	997.7	965.6	169.9	150.4	39.5	30.9	80.9	62.4
LATIN AMERICA									
Argentina	Yacimientos Petroliferos Fiscales SA	NA	NA	NA	NA	NA	NA	NA	NA
Bolivia	Yacimientos Petroliferos Fiscales Bolivianos	NA	\$560.0	NA	\$252.0	NA	\$208.0	NA	\$790.0
Brazil	Petrobras Brasileiro SA	12,647.7	16,065.5	20,448.2	18,787.9	510.7	127.9	2,118.0	2,372.0
Chile	Empresa Nacional del Petroleo	1,009.4	804.7	1,545.4	1,149.4	51.3	49.0	90.0	84.1
Colombia	Empresa Colombiana de Petroleos	2,971.1	NA	NA	NA	NA	NA	NA	NA
Ecuador	Petroleos del Ecuador	NA	NA	NA	NA	NA	NA	NA	NA
Guatemala	Ministry of Energy and Mines	NA	NA	NA	NA	NA	NA	NA	NA
Mexico	Petroleos Mexicanos	45,079.2	42,378.6	19,366.0	15,114.0	1,489.2	321.2	1,740.3	1,651.1
Peru	Petroleos del Peru SA	NA	NA	NA	NA	NA	NA	NA	NA
Suriname	State Oil Co. Suriname NV	25.3	23.4	12.9	11.0	0.4	1.1	7.5	8.3
Trinidad	Trintopex	311.0	283.2	172.3	158.6	18.8	11.6	30.1	25.7
Trinidad	Trintoc	466.0	343.8	573.7	527.4	27.5	27.4	61.7	39.6
Venezuela	Petroleos de Venezuela SA	22,100.0	29,907.0	23,000.0	13,752.7	1,300.0	2,111.6	\$2,500.0	4,791.8
WESTERN EUROPE									
Austria	OMV Aktiengesellschaft	3,533.8	3,041.3	4,365.7	3,174.3	33.5	27.2	1,006.6	359.4
Belgium	Petrofina SA	12,308.5	9,455.1	17,335.4	14,679.2	651.6	554.5	2,020.7	1,205.4
Finland	Neste Corp.	11,531.4	9,471.6	12,858.7	9,620.8	650.9	510.3	NA	830.0
France	Coparex	154.9	88.4	56.2	10.6	35.2	22.9	37.5	8.3
France	Gaz de France	24.9	20.0	7.7	6.1	(17.7)	(7.1)	836.0	663.7
France	St. Nat. Elf Aquitaine	42,308.5	33,181.4	32,315.9	23,507.4	1,951.8	1,132.7	6,628.9	4,896.1
France	Total	20,643.4	15,275.9	23,643.1	16,932.2	755.0	125.5	3,701.1	1,365.2
Germany	Deminex	1,787.0	1,804.0	1,210.0	825.0	95.0	71.0	385.0	418.0
Germany	Wintershall AG	2,010.0	1,556.0	3,148.0	1,786.8	189.9	120.6	195.4	179.0
Italy	Ente Nazionale Idrocarburi	60,336.0	49,207.2	41,827.6	32,442.7	1,732.2	1,499.6	5,725.8	5,571.0

Worldwide oil production Million bbl		Worldwide natural gas production Bcf		Worldwide oil reserves Million bbl		Worldwide natural gas reserves Bcf	
1990	1989	1990	1989	1990	1989	1990	1989
8.2	7.7	99.3	99.3	219.0	222.9	1,398.0	1,412.0
33.8	36.0	278.9	302.4	302.0	322.1	4,394.0	4,566.0
12.4	12.6	63.4	65.4	96.8	74.8	1,044.8	1,028.4
3.2	3.0	73.8	59.5	41.9	46.7	810.7	753.0
3.4	4.7	0.0	0.0	30.2	43.1	137.8	176.8
7.6	8.2	75.4	77.5	45.7	47.0	712.0	739.0
0.0	0.0	3.5	3.8	0.3	0.3	129.5	124.9
3.0	1.2	5.4	2.6	21.7	10.2	96.9	47.8
29.5	32.4	106.4	75.5	235.0	217.0	1,081.0	1,117.0
1.7	1.3	7.6	6.9	11.0	11.2	126.4	123.4
2.0	2.0	2.2	2.4	43.4	42.3	63.8	72.3
⁵ 1.7	⁵ 1.2	8.6	5.7	20.1	14.6	155.2	111.3
⁵ 12.6	⁵ 14.6	67.0	76.7	⁵ 122.0	⁵ 129.5	1,095.0	1,170.0
33.7	36.6	122.6	125.5	390.0	403.0	1,700.0	1,800.0
9.1	9.6	58.2	55.0	84.0	86.4	1,256.0	1,193.0
17.5	19.5	76.4	85.2	221.8	249.6	1,510.6	1,572.1
124.8	126.7	233.2	234.7	2,141.0	2,264.0	4,730.0	5,087.0
9.6	9.7	48.0	45.0	93.8	97.3	1,037.0	981.0
3.0	2.7	29.0	24.3	27.6	25.5	589.4	553.1
17.4	13.8	72.6	58.8	122.7	121.7	1,086.6	1,201.7
⁵ 1.8	⁵ 1.5	73.9	63.7	⁵ 16.2	⁵ 12.4	1,214.5	1,012.0
1.8	1.7	5.6	5.0	20.5	20.9	262.7	246.3
30.8	28.8	134.0	141.0	345.1	349.5	2,303.0	2,250.0
34.3	36.5	181.8	209.1	223.2	227.6	3,025.0	3,351.0
3.6	2.6	0.1	0.1	⁵ 27.0	⁵ 15.7	460.1	417.9
5.3	5.6	13.7	9.9	28.3	33.7	284.0	152.3
⁵ 6.1	⁵ 5.0	52.0	35.1	⁵ 37.4	⁵ 29.3	543.3	466.3
10.8	7.7	77.1	63.7	103.5	83.9	1,080.6	941.9
8.0	6.6	53.1	56.7	51.2	49.1	579.0	677.8
3.2	3.3	25.6	24.5	32.0	32.0	337.0	297.0
3.1	2.8	30.3	25.9	38.4	40.9	714.6	665.7
⁵ 5.6	⁵ 5.7	23.0	21.9	⁵ 45.2	⁵ 48.7	629.6	631.1
174.8	⁵ 167.9	⁵ 816.1	⁵ 719.7	⁵ 2,280.0	⁵ 2,279.9	⁵ 27,000.0	⁵ 27,299.0
NA	7.3	NA	186.8	NA	119.2	NA	4,148.7
238.6	225.1	221.7	215.9	2,800.2	2,794.5	4,046.0	4,096.7
7.2	8.1	148.3	149.6	NA	300.0	NA	4,200.0
160.4	147.0	140.5	177.3	1,935.2	1,947.0	3,889.1	4,209.0
104.4	⁵ 101.8	³ 3.6	³ 3.6	⁵ 1,420.0	⁵ 1,514.0	³ 3,950.0	³ 3,990.0
1.4	1.6	0.3	0.3	38.2	37.1	⁵ 10.0	10.0
963.6	945.7	1,332.8	1,303.7	51,298.0	51,983.0	71,508.0	72,744.0
⁵ 46.7	⁵ 47.5	⁵ 46.0	⁵ 46.0	⁵ 405.9	⁵ 412.0	⁵ 7,082.0	⁵ 781.9
1.4	1.4	0.0	0.0	37.6	32.5	0.0	0.0
NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA
779.3	696.3	1,339.9	1,430.1	60,055.0	59,041.0	121,093.2	105,688.7
17.2	12.1	27.1	28.1	185.6	139.4	416.7	321.4
42.7	43.7	209.7	199.6	¹⁰ 849.0	¹⁰ 772.0	NA	NA
3.7	1.8	NA	NA	100.6	10.0	NA	NA
0.0	0.0	19.1	10.8	13.0	11.9	300.2	180.1
NA	NA	0.1	0.1	NA	NA	4.7	4.8
189.0	165.0	452.0	516.0	2,022.0	1,722.0	5,959.0	4,824.0
162.8	148.9	310.8	296.6	3,798.0	3,760.0	6,280.0	5,680.0
49.4	35.3	18.4	13.8	¹¹ 730.0	^{11,12} 727.0	¹³ 747.0	¹³ 462.0
¹⁴ 31.4	¹⁴ 27.2	¹⁴ 70.0	¹⁴ 78.6	NA	NA	NA	NA
178.9	160.3	625.1	614.5	2,942.1	2,852.6	11,684.4	11,396.0

Leading oil and gas companies around the world

Country	Company	Total assets		Total revenues		Total net income		Capital and exploratory expenditures	
		1990	1989	1990	1989	1990	1989	1990	1989
Million \$									
Netherlands	Royal Dutch/Shell	32,630.8	29,428.9	40,703.5	28,053.9	7,924.1	5,825.1	3,258.5	2,937.8
Norway	Norsk Hydro AS.....	13,578.6	11,265.9	9,760.8	9,613.5	464.4	389.4	1,402.8	1,428.8
Norway	Saga Petroleum SA	2,239.1	1,782.7	618.2	443.4	33.3	28.6	433.0	226.0
Norway	Statoil	12,561.5	9,768.7	13,043.0	9,920.1	523.5	735.8	1,119.2	861.8
Spain	Repsol SA.....	12,265.6	8,916.7	15,468.1	10,035.7	666.6	545.0	1,232.0	865.2
Turkey	Turkish Petroleum Corp.	1,158.3	767.3	437.4	224.7	250.1	173.2	179.3	132.1
U.K.	British Gas plc ¹	51,872.8	38,305.6	16,938.7	13,089.7	1,634.8	1,139.6	3,034.0	1,774.2
U.K.	British Petroleum Co. plc.....	59,245.0	50,900.0	74,663.0	61,326.0	3,022.0	3,500.0	6,823.0	5,745.0
U.K.	Clyde Petroleum plc.....	863.0	615.4	130.6	96.4	25.5	21.9	25.9	76.3
U.K.	Laemo plc.....	2,004.9	1,603.4	358.1	263.4	81.5	59.9	910.3	514.2
U.K.	Sovereign Oil & Gas plc	157.8	125.3	36.4	20.1	4.9	0.8	19.6	21.2
U.K.	Ultramar plc.....	4,466.0	3,661.0	3,400.0	2,830.0	230.0	165.0	572.0	313.0
AFRICA									
Algeria	Sonatrach	NA	NA	NA	NA	NA	NA	NA	NA
Benin	Projet Petrolier Seme-Ashland	43.8	44.7	28.1	21.0	NA	NA	8.3	12.3
Libya	National Oil Corp.	NA	NA	NA	NA	NA	NA	NA	NA
Nigeria	Nigerian National Petroleum Corp.....	NA	NA	NA	NA	NA	NA	NA	NA
Tunisia	Entreprise Tunisienne Activites Petrolieres..	NA	412.5	NA	136.8	NA	23.7	NA	16.2
MIDDLE EAST									
Abu Dhabi	Abu Dhabi National Oil Co.	NA	NA	NA	NA	NA	NA	NA	NA
Bahrain	Bahrain National Oil Co.	NA	NA	NA	NA	NA	NA	NA	NA
Dubai	Dubai Petroleum Co.	NA	NA	NA	NA	NA	NA	NA	NA
Iran	National Iranian Oil Co.	NA	NA	NA	NA	NA	NA	NA	NA
Iraq	Iraq National Oil Co.	NA	NA	NA	NA	NA	NA	NA	NA
Kuwait	Kuwait Petroleum Corp.	NA	23,079.0	NA	12,738.5	NA	717.3	NA	976.4
Oman	Petroleum Development Oman	NA	NA	NA	NA	NA	NA	NA	NA
Qatar	Qatar General Pet. Corp.	NA	NA	NA	NA	NA	NA	NA	NA
Saudi Arabia	Saudi Arabian Oil Co.	NA	NA	NA	NA	NA	NA	NA	NA
Syria	Syrian Petroleum Co.	NA	NA	NA	NA	NA	NA	NA	NA
ASIA PACIFIC									
Australia	BHP Petroleum Pty. Ltd. ²	5,483.3	5,793.6	3,926.0	2,131.8	309.1	268.0	NA	601.8
Australia	Bridge Oil Ltd.	640.3	550.9	176.6	126.0	(63.3)	13.5	44.5	53.1
Australia	Crusader Ltd. ²	203.4	188.8	83.3	83.4	3.0	9.5	18.5	17.2
Australia	Oil Co. of Australia NL.....	3,128.8	2,698.4	3,090.0	2,872.9	251.6	244.9	358.6	379.8
Australia	Petroz NL.....	41.6	41.2	15.7	18.9	1.7	2.3	4.4	6.4
Australia	Santos Ltd.....	2,290.9	2,323.9	635.1	477.9	121.9	92.7	193.2	177.4
Brunei	Petroleum Unit.....	NA	NA	NA	NA	NA	NA	NA	NA
China	China National Offshore Oil Corp.	NA	440.6	NA	107.9	NA	2.2	NA	56.1
India	Oil & Natural Gas Commission.....	NA	NA	NA	NA	NA	NA	NA	NA
Indonesia	Pertamina	11,827.4	10,926.2	14,162.9	10,525.7	676.2	507.8	NA	5,973.2
Japan	Idemitsu Kosan Co. Ltd. ¹	NA	9,111.5	NA	10,856.2	NA	10.0	NA	NA
Korea	Yukong Ltd.....	4,095.0	2,735.0	4,608.0	3,885.0	44.0	98.0	933.0	951.0
Malaysia	Petronas	NA	NA	NA	NA	NA	NA	NA	NA
New Zealand	New Zealand Oil & Gas Ltd. ³	53.6	55.7	3.4	11.7	(1.0)	12.3	*23.6	*19.5
New Zealand	Southern Petroleum NL ³	51.7	39.3	25.1	10.0	13.7	2.0	11.9	9.4
Philippines	Philippine National Oil Co.	1,537.6	1,517.0	1,205.1	950.5	61.2	70.5	79.8	79.1
Taiwan (China)	Chinese Petroleum Corp. ¹⁶	11,512.6	9,406.0	8,807.9	7,275.6	355.8	1,673.0	1,976.1	1,329.0
Thailand	Petroleum Authority of Thailand ⁴	1,753.6	1,465.5	2,270.6	1,779.9	136.4	84.1	2,134.1	1,695.8

NA = Not available.

Fiscal year end is Dec. 31 unless otherwise noted. 1. Fiscal year ends March 31. 2. Fiscal year ends May 31. 3. Fiscal year ends June 30. 4. Fiscal year ends Sept. 30. 5. Includes NGL. 6. Formerly Interhome Energy Inc. 7. Excludes acquisitions. 8. Estimates. 9. Excludes exploration. 10. Includes natural gas. 11. Proven & probable. 12. Based on working interest. 13. Net. 14. Includes Deminor interest (Wintershall AG holds 18.5%). 15. Sales. 16. Recoverable. 17. Includes LPG. 18. Exchange rate end of year.

Worldwide oil production Million bbl		Worldwide natural gas production Bcf		Worldwide oil reserves Million bbl		Worldwide natural gas reserves Bcf	
1990	1989	1990	1989	1990	1989	1990	1989
692.0	675.6	2,203.1	2,160.1	10,107.0	9,496.0	51,575.0	40,356.0
32.9	27.7	85.8	122.2	588.9	575.4	4,961.9	4,903.1
¹⁵ 20.1	¹⁵ 18.6	¹⁵ 9.8	¹⁵ 9.9	432.3	445.3	3.6	2.7
124.0	119.0	109.5	102.9	2,239.1	2,214.0	14,761.4	13,843.3
56.1	51.4	30.1	44.6	396.7	418.1	135.0	172.7
20.2	13.8	7.5	6.1	NA	NA	NA	NA
22.5	20.4	342.0	191.0	234.7	184.7	7,867.0	7,005.0
422.0	482.0	548.0	478.0	4,653.0	4,922.0	11,023.0	11,444.0
4.7	4.0	14.2	17.2	81.3	75.8	323.9	248.5
29.1	23.8	12.9	13.4	403.9	391.4	306.8	242.5
1.6	1.2	NA	NA	29.7	34.1	59.8	59.8
9.0	10.0	184.6	168.2	¹¹ 107.5	¹¹ 104.4	¹³ 3,120.4	¹³ 3,262.8
² 289.8	² 262.1	² 1,788.3	² 1,709.2	² 9,200.0	² 9,200.0	² 114,700.0	² 114,000.0
1.4	1.3	NA	NA	¹⁵ 19.9	¹⁵ 19.9	NA	NA
⁵⁰ 1.5	⁴ 18.3	² 202.9	² 182.0	² 22,800.0	² 22,800.0	² 43,000.0	² 25,500.0
660.5	626.7	1,087.8	887.5	17,899.8	15,345.3	104,720.0	103,560.0
³ 33.9	³ 37.6	² 13.1	² 13.0	² 1,700.0	² 1,750.0	³ 3,000.0	³ 3,100.0
⁵ 95.7	⁵ 536.6	⁵ 539.3	⁵ 500.9	² 92,200.0	² 92,205.0	² 182,800.0	² 182,900.0
⁵ 15.3	⁵ 15.7	² 209.9	² 193.9	² 97.5	² 111.7	² 6,250.0	² 6,476.0
⁵ 158.8	⁵ 157.3	² 102.1	² 80.5	² 4,000.0	² 4,000.0	² 4,800.0	² 4,900.0
¹ 1,144.6	¹ 1,075.7	² 854.4	² 793.9	² 92,850.0	² 92,860.0	² 600,350.0	² 500,000.0
⁷ 59.2	¹ 1,057.4	² 140.7	² 201.8	² 100,000.0	² 100,000.0	² 95,000.0	² 95,000.0
³ 93.8	581.4	² 184.7	222.9	² 94,525.0	² 94,525.0	² 48,600.0	² 48,600.0
² 42.4	² 223.7	² 98.9	² 98.5	² 4,300.0	² 4,250.0	² 7,200.0	² 9,260.0
² 143.4	² 141.3	² 265.1	² 256.3	² 4,500.0	² 4,500.0	² 163,200.0	² 163,100.0
² 2,284.0	² 1,775.2	² 1,077.1	² 1,052.4	² 257,504.0	² 254,929.0	² 180,355.0	² 181,347.0
² 141.8	² 124.1	² 103.1	² 95.3	² 1,700.0	² 1,730.0	² 5,500.0	² 4,000.0
NA	75.8	NA	175.2	721.0	756.0	5,885.0	6,032.0
3.4	3.0	¹¹ 45.9	¹¹ 24.9	¹¹ 26.8	¹¹ 32.7	¹¹ 346.4	¹¹ 209.2
NA	1.3	NA	14.4	NA	5.5	NA	123.7
0.4	0.4	2.6	NA	NA	NA	NA	NA
0.2	0.2	3.6	3.3	3.4	3.4	308.8	308.8
14.2	13.4	104.7	107.9	101.6	119.7	2,478.0	2,500.0
⁴ 7.8	⁴ 49.6	² 278.6	² 294.2	² 1,350.0	² 1,375.0	² 1,120.0	² 11,370.0
NA	0.7	NA	NA	NA	6,335.9	NA	32.4
² 243.1	² 247.1	² 437.7	² 374.4	² 7,997.1	² 7,516.0	² 25,049.0	² 22,973.0
533.7	514.2	2,158.9	1,975.4	10,728.6	10,899.4	67,415.4	71,895.8
NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA
NA	205.5	NA	526.0	NA	2,950.0	NA	51,900
0.0	0.0	0.0	0.0	¹¹ 74.0	¹¹ 59.0	¹¹ 419.0	¹¹ 332.0
0.8	0.5	3.8	2.2	3.6	4.4	18.2	22.0
NA	NA	NA	NA	NA	NA	NA	NA
1.1	1.0	40.8	42.2	NA	NA	NA	NA
15.4	14.1	228.1	208.4	NA	230.0	NA	7,418.4

1991 Worldwide Petrochemical Survey

ABU DHABI

RUWALS FERTILIZER INDUSTRIES

Ruwals. Feed: associated gas. Products: ammonia (1,050 mt/d), urea (1,500 mt/d).

ALGERIA

SONATRACH

Arzew. Feed: natural gas. Products: ammonia (1,000 mt/d), aromatics mix (1,152 mt/d), benzene (273 mt/d), ethylene (364 mt/d), formaldehyde (61 mt/d), methanol (303 mt/d), orthoxylene (115 mt/d), id polyethylene (145 mt/d), polyvinyl chloride (106 mt/d), toluene (5,000 mt/d), urea (400 mt/d), xylene mix (748 mt/d).

ARGENTINA

ATANOR

Baradero, Buenos Aires. Feed: ethyl alcohol. Products: acetaldehyde (8,700 mt/y), acetic acid (11,050 mt/y), acetic anhydride (2,400 mt/y), acetates (12,600 mt/y).

Munro, Buenos Aires. Feed: acetates, ethyl alcohol, methanol. Products: acetaldehyde (2,405 mt/y), acetic acid (3,210 mt/y), acetone (1,400 mt/y), ethanol (11,200 mt/y), formaldehyde (25,680 mt/y).

Rio Tercero, Córdoba. Feed: brine, gas. Products: acetaldehyde (8,700 mt/y), acetic acid (15,600 mt/y), acetic anhydride (2,400 mt/y), formaldehyde (31,000 mt/y), methanol (12,250 mt/y).

CARBOCLOR INDUSTRIAS QUIMICAS

Campana. Feed: C₃ and C₄ refinery cuts. Products: acetone (17,000 mt/y), butanol (10,000 mt/y), isopropanol (48,000 mt/y).

CASCO SAIC

Pilar. Feed: natural gas. Products: formaldehyde (38,000 mt/y), methanol (20,000 mt/y).

DIRECCION GENERAL DE FABRICACIONES MILITARES

Campana. Feed: hydrocarbon fractions. Products: aromatics mix, normal paraffins, toluene, xylene mix, solvents.

Rio Tercero, Córdoba. Feed: natural gas. Product: ammonia (14,600 mt/y).

DUPERIAL SAIC

(subsidiary of Imperial Chemical Industries)

San Lorenzo. Feed: refinery products, xylene. Products: ethylene (21,000 mt/y), phthalic anhydride (12,400 mt/y), id polyethylene (21,000 mt/y).

ELECTROCLOR SAIC

Capitán Bermúdez, Santa Fe. Feed: calcium carbide, chlorine, hydrogen. Products: acetylene (15,000 mt/y), ammonia (3,000 mt/y), polyvinyl chloride (32,000 mt/y), vinyl chloride (33,500 mt/y).

IPAKO-Industrias Petroquímicas Argentinas

(owned by private Argentine interests).

Ensenada. Feed: refinery gases. Products: ethylene (15,000 mt/y), id polyethylene (14,000 mt/y).

MALEIC SA

Ensenada, Buenos Aires. Feed: n-butane. Product: maleic anhydride (10,000 mt/y).

MONSANTO ARGENTINA SAIC

Zarate. Feed: styrene. Products: ABS (7,000 mt/y), polystyrene (40,000 mt/y).

PASA PETROQUIMICA ARGENTINA

(owned by Amcorp SA, Anglo American Corp., Argentina Holdings Ltd., Uniroyal Chemical Co. Inc., Perez Companc)

Campana. Feed: natural gas. Products: ammonia (80,000 mt/y), urea (130,000 mt/y).

Puerto Gral. San Martín, Santa Fe. Feed: butane, naphtha, propane. Products: aromatics (180,000 mt/y), butadiene (37,000 mt/y), ethylbenzene (66,000 mt/y), ethylene (24,000 mt/y), styrene (70,000 mt/y), SBR (53,000 mt/y).

PETROQUIMICA BAHIA BLANCA SAIC

Bahia Blanca. Feed: ethane. Products: ethylene (201,000 mt/y).

PETROQUIMICA GENERAL MOSCONI

Ensenada, Buenos Aires. Feed: naphtha. Products: aromatics mix (250,000 mt/y), benzene (120,000 mt/y), cyclohexane (80,000 mt/y), orthoxylene (25,000 mt/y), paraxylene (40,000 mt/y), toluene (120,000 mt/y), xylene mix (10,000 mt/y).

POLISUR

Bahia Blanca. Feed: ethylene. Product: id polyethylene (190,000 mt/y).

SUDAMTEX SA

Azul, Buenos Aires. Feed: dimethyl terephthalate, ethylene glycol. Products: methanol (1,650 mt/y), polyester (6,500 mt/y).

AUSTRALIA

ALTONA PETROCHEMICAL CO. LTD.

(50% Esso Australia Ltd., 50% Mobil Oil Australia).

Altona, Vic. Feed: gas oil, ethane. Products: butadiene (17,000 mt/y), carbon black oil (50,000 mt/y), ethylene (170,000 mt/y), propylene (50,000 mt/y).

AMPOL REFINERIES LTD.

Lytton, Brisbane. Feed: crude oil. Products: toluene (5,500 mt/y).

AUSTRALIAN SYNTHETIC RUBBER CO. LTD.

(35% Esso Australia Ltd., 35% Mobil Oil Australia Ltd., 30% Goodyear Tire & Rubber Co. Ltd.)

Altona. Feed: butadiene, styrene. Products: polybutadiene (10,000 mt/y), SBR (35,000 mt/y).

BORDEN AUSTRALIA PTY. LTD.

Brisbane, Gibson Island. Feed: methanol. Product: formaldehyde (28,000 mt/y).

Melbourne. Feed: methanol. Product: formaldehyde (28,000 mt/y).

CABOT AUSTRALIA PTY. LTD.

Altona, Vic. Feed: petroleum residual. Product: carbon black (50,000 mt/y).

CHEMPLEX AUSTRALIA LTD.

West Footscray. Feed: benzene, ethane, propylene. Products: acetone (12,000 mt/y), ethylbenzene (136,000 mt/y), ethylene (33,000 mt/y), phenol (20,000 mt/y), styrene (104,000 mt/y), unsaturated polyester (14,000 mt/y), polystyrene (25,000 mt/y), SBR latex (10,000 mt/y).

COMPOL LTD.

(50% Mobil, 50% Exxon)

Altona, Vic. Feed: ethylene. Products: polyethylene (110,000 mt/y).

CONTINENTAL CARBON AUSTRALIA PTY. LTD.

(49% affiliate of Witco Corp.—Concarb Div.)

Kurnell, NSW. Feed: creosote oil. Product: carbon black (30,000 mt/y).

HOECHST AUSTRALIA LTD.

(owned 95% by Hoechst AG)

Altona. Feed: olefins. Products: hd polyethylene (75,000 mt/y), polypropylene (35,000 mt/y).

ICI AUSTRALIA LTD.

Botany, NSW. Feed: LPG, light naphtha. Products: butadiene (23,000 mt/y), butylenes (23,000 mt/y), ethylene (250,000 mt/y), ethylene oxide (36,000 mt/y), id polyethylene (90,000 mt/y), polypropylene (55,000 mt/y), propylene (95,000 mt/y), polyvinyl chloride (55,000 mt/y), vinyl chloride (60,000 mt/y).

Laverton, Vic. Feed: vinyl chloride. Product: polyvinyl chloride (55,000 mt/y).

Rhodes. Feed: ethylene, heptene, natural gas, naphthalene, propylene. Products: acetaldehyde (15,000 mt/y), acetic acid (20,000 mt/y), butanols (9,000 mt/y), iso-octanol (14,000 mt/y), phthalic anhydride (21,500 mt/y), vinyl acetate (14,000 mt/y), solvents (9,500 mt/y), plasticizers (32,500 mt/y).

INCITEC LTD.

Gibson Island, Queensland. Feed: natural gas. Products: ammonia (245,000 mt/y), urea (245,000 mt/y).

Newcastle, NSW. Feed: natural gas. Product: ammonia (238,000 mt/y).

KWINANA NITROGEN CO. PTY. LTD.

Kwinana. Feed: natural gas. Product: ammonia (111,325 mt/y).

SHELL CHEMICAL (AUSTRALIA) PTY. LTD.

Clyde, N.S.W. Feed: refinery gases. Product: polypropylene (35,000 mt/y).

Geelong, Victoria. Feed: naphtha, gasoline, refinery gases. Products: alkylbenzene (18,000 mt/y), toluene (20,000 mt/y), xylene mix (25,000 mt/y), polypropylene (70,000 mt/y).

AUSTRIA

CHEMIE HOLDING AG

Enns. Feed: propylene. Product: acrylonitrile (75,000 mt/y).

Linz. Feed: benzene, orthoxylene. Products: maleic anhydride (19,000 mt/y), melamine (35,000 mt/y), phthalic anhydride (37,000 mt/y), urea (400,000 mt/y), plasticizers (38,000 mt/y).

HALVIC KUNSTSTOFFWERKE GmbH

Hallein. Feed: vinyl chloride monomer. Product: polyvinyl chloride.

OMV AG

Schwechat. Feed: butane, gasoline, naphtha. Products: butadiene (50,000 mt/y), ethylene (320,000 mt/y), propylene (160,000 mt/y).

PETROCHEMIE DANUBIA GmbH

(66 2/3% OMV AG, 33 1/3% Co. Ltd. Holding AG)

Schwechat. Feed: ethylene, propylene. Products: polyethylene (330,000 mt/y), polypropylene (230,000 mt/y).

VIANOVA KUNSTHARZ AG

Werndorf. Feed: alcohols, acids, oils. Products: acrylics and alkyls, unsaturated polyesters, water soluble resins (40,000 mt/y).

BAHRAIN**GULF PETROCHEMICAL INDUSTRIES CO.**

Manama. Feed: methane. Products: ammonia (438,000 mt/y), methanol (438,000 mt/y).

BANGLADESH**ZIA FERTILIZER CO. LTD.**

(Bangladesh Chemical Industries Corp.)

Ashuganj. Feed: natural gas. Products: ammonia (347,500 mt/d).

BELGIUM**AMOCO CHEMICAL CO.**

Geel. Feed: metaxylene, methanol, paraxylene, propylene. Products: isophthalic acid (41,000 mt/y), polypropylene (132,000 mt/y), terephthalic acid (138,000 mt/y).

ARCO CHEMICAL.

Rieme. Product: polyols (81,500 mt/y).

BASF ANTWERPEN NV

Antwerp. Feed: ethylene, benzene, cyclohexane. Products: caprolactam (150,000 mt/y), ethylene glycol (160,000 mt/y), ethylene oxide (150,000 mt/y), polystyrene (145,000 mt/y), polyvinyl chloride (100,000 mt/y), vinyl chloride (160,000 mt/y).

BAYER ANTWERPEN NV

Antwerp and Kato. Feed: cyclohexane. Products: caprolactam (120,000 mt/y), polyamide (10,000 mt/y).

BP CHEMICALS BELGIUM

Antwerp. Products: glycols (130,000 mt/y), ethylene oxide (115,000 mt/y), 1,2 polyethylene (130,000 mt/y), esters-ethers (75,000 mt/y).

DOW CHEMICAL

Tessenderlo. Products: polystyrene, hd polyethylene.

DSM**Limburgse Vinyl MNV**

(joint venture with Entreprise Minière et Chimique)

Tessenderlo. Feed: ethylene, C12 HCl. Product: vinyl chloride (450,000 mt/y).

ATOCHER BELGIUM

Wetteren. Product: polyvinyl chloride compounds (17,000 mt/y), vinyl compound (20,000 mt/y).

EXXON CHEMICAL BELGIUM

Antwerp. Feed: hydrocarbons. Products: solvents (680,000 mt/y).

Meerhout. Feed: ethylene. Product: polyethylene (315,000 mt/y).

Zwijndrecht. Feed: ethylene. Product: EVA copolymers (250,000 mt/y).

FINAMONT SA

(50% Petrofina, 50% Montedipe)

Feluy. Feed: styrene. Products: polystyrene mass (70,000 mt/y), expandable polystyrene (30,000 mt/y).

KEMIRA SA.

Tertre. Feed: natural gas. Products: ammonia (390,000 mt/y), urea (230,000 mt/y).

MONTEFINA.

(50% Himont Inc., 50% Petrofina)

Feluy. Feed: propylene. Products: polypropylene (360,000 mt/y).

NESTE POLYPROPYLENE NV

Beringen. Feed: propylene. Product: polypropylene (240,000 mt/y).

PHILLIPS 66 CO.

Tessenderlo. Feed: olefins. Product: petrosulfur compounds (13,000 mt/y).

POLYSAR BELGIUM NV

Antwerp. Feed: isobutylene. Products: butyl rubber (85,000 mt/y).

SOLVAC SA

Antwerp. Feed: ethylene, propylene. Products: hd polyethylene, polypropylene.

SOLVIC SA

Jemeppe-sur-Sambre. Feed: ethylene. Products: vinyl chloride, polyvinyl chloride.

UCB-FITAL

Ostend. Feed: alcohols, cyclohexanol, orthoxylenes, phenol. Products: phthalic anhydride (80,000 mt/y), phthalates (65,000 mt/y).

BRAZIL**ALBA AMAZONIA SA**

Manaus. Feed: methanol. Product: formaldehyde (30,000 mt/y).

ALBA QUÍMICA SA

Cotia, S.P. Feed: ethanol, methanol. Products: acetaldehyde (7,200 mt/y), formaldehyde (25,200 mt/y).

Cubatão, S.P. Feed: methanol, naphtha. Products: formaldehyde (45,400 mt/y), methanol (33,600 mt/y).

Curitiba, P.R. Feed: methanol. Products: formaldehyde (45,400 mt/y).

BANN QUÍMICA SA

Ermelino Matarazzo, SP. Feed: aniline. Product: rubber chemicals (12,800 mt/y).

Paulinia, SP. Feed: benzene, naphtha. Product: aniline (6,000 mt/y).

CAPUAVA CARBONOS INDUSTRIAIS SA

Mauá, São Paulo. Feed: ethylene tar. Product: carbon black (57,000 mt/y).

CELBRAS QUÍMICA E TEXTIL SA

Aratu, Bahia. Feed: dimethyl terephthalate, glycol. Product: polyester (6,000 mt/y).

Camacari, Bahia. Feed: acrylonitrile, maleic anhydride, dimethylformamide. Product: acrylics (14,000 mt/y).

Poços de Caldas. Feed: glycol, terephthalic acid. Product: polyester (33,000 mt/y).

CIA. DE CARBONOS COLOIDAIIS

Candeias, Bahia. Feed: heavy aromatic hydrocarbons. Product: carbon black (56,000 mt/y).

CIQUINE—Cia. Industrias Químicas do Nordeste

Camacari, Bahia. Feed: benzene, orthoxylenes, phthalic anhydride, 2-ethyl hexanol, propylene. Products: maleic anhydride (6,400 mt/y), phthalic anhydride (28,000 mt/y), plasticizers (10,000 mt/y), propylene (38,800 mt/y).

COMPANHIA BRASILEIRA DE ESTIRENO

Cubatão, S.P. Feed: benzene, ethanol, ethylene. Products: ethylene (4,800 mt/y), ethylbenzene (100,000 mt/y), ethylchloride (640 mt/y), styrene (100,000 mt/y), toluene (3,200 mt/y).

COMPANHIA BRASILEIRA DE POLIURETANOS. Camacari.

Product: diphenyl methane diisocyanate (12,000 mt/y).

COPENE

Camacari, Bahia. Feed: gas oil, naphtha. Products: aromatics (200,000), benzene (222,000 mt/y), butadiene (79,000 mt/y), butylenes (46,000 mt/y), ethylene (460,000 mt/y), orthoxylenes (70,000 mt/y), MTBE (68,000 mt/y), paraxylene (130,000 mt/y), propylene (272,000 mt/y), solvent (45,000 mt/y), toluene (30,000 mt/y), xylene mix (41,000 mt/y).

COPERBO

Cabo, Pernambuco. Feed: ethyl alcohol, butadiene, styrene. Products: acetaldehyde (50,000 mt/y), acetic acid (70,000 mt/y), ethylene (36,000 mt/y), polybutadiene (78,000 mt/y), SBR (18,000 mt/y), thermoplastic elastomer (4,000 mt/y), vinyl acetate (80,000 mt/y).

COPESUL

Triunfo, RGS. Feed: naphtha. Products: benzene (199,000 mt/y), butadiene (96,000 mt/y), ethylene (561,000 mt/y), propylene (300,000 mt/y), toluene (22,000 mt/y), xylene mix (72,000 mt/y).

ESTIRENO DO NORDESTE SA

Camacari, Bahia. Feed: benzene, ethylene. Products: ethylbenzene (180,000 mt/y), polystyrene (100,000 mt/y), styrene (150,000 mt/y), toluene (800 mt/y).

FISIBA

Camacari, Bahia. Feed: acrylonitrile. Product: acrylics (1,100 mt/y).

FOSFANIL

Sao Paulo. Feed: sulphur, rock phosphate, potash. Product: sulphuric acid, fertilizers (100,000 mt/y).

INETEX

Sao Paulo. Feed: methanol. Product: formaldehyde (45,000 mt/y).

METANOR SA—Metanol do Nordeste

Camacari, Bahia. Feed: carbon dioxide, natural gas. Product: methanol (70,400 mt/y).

NITRIFLEX SA

Duque de Caxias, Rio de Janeiro. Feed: acrylonitrile, butadiene, styrene. Products: ABS (21,000 mt/y).

Triunfo, RS. Feed: ENB, ethylene, propylene. Product: ethylene-propylene (10,000 mt/y).

NITROCARBONO SA

Camacari. Feed: ammonia, benzene, hydrogen. Products: caprolactam (53,000 mt/y), cyclohexane (55,000 mt/y), cyclohexanone (47,700 mt/y).

NITROFÉLIT

Camacari, Bahia. Feed: natural gas. Products: ammonia (1,043 mt/d), urea (800 mt/d), hydrogen (22 mt/d), carbon dioxide (200 mt/d).

Laranjeiras, Sergipe. Feed: natural gas. Products: ammonia (907 mt/d), urea (1,100 mt/d).

OXITENO SA INDÚSTRIA E COMÉRCIO

Camacari, RS. Feed: ethylene. Products: ethylene glycol (122,130 mt/y), ethylene oxide (122,500 mt/y).

Itaguaí, RJ. Feed: Ethylene. Products: ethylene glycol (80,000 mt/y), ethylene oxide (100,000 mt/y).

Mauá, São Paulo. Feed: ethylene. Products: ethylene glycol (25,000 mt/y), ethylene oxide (40,000 mt/y).

Triunfo, RS. Feed: propylene. Products: isopropanol (20,000 mt/y).

PETROFLEX

Duque de Caxias. Feed: butadiene, ethylbenzene, styrene. Products: styrene (60,000 mt/y), SBR (185,000 mt/y).

Triunfo. Feed: benzene, butadiene, ethylene, styrene. Products: ethylbenzene (140,000 mt/y), SBR (40,000 mt/y).

PETROQUÍMICA TRIUNFO SA

Triunfo, Rio Grande do Sul. Feed: ethylene. Product: hd polyethylene (130,000 mt/y).

PETROQUÍMICA UNIÃO SA

Santo André, Capuava. Feed: naphtha. Products: alkylbenzene (24,000 mt/y), aromatics (326,000 mt/y), benzene (170,000 mt/y), butadiene (50,000 mt/y), butylenes (59,400 mt/y), ethylene (360,000 mt/y), orthoxylenes (35,000 mt/y), propylene (204,000 mt/y), toluene (42,000 mt/y), xylene mix (55,000 mt/y), pyrolysis gasoline (103,000 mt/y), resins (10,000 mt/y).

POLIALDEN PETROQUÍMICA SA

Camacari, Bahia. Feed: ethylene. Product: hd polyethylene (100,000 mt/y).

POLIBRASIL SA

Camacari, São Paulo. Feed: propylene. Product: polypropylene (100,000 mt/y).

Mauá, São Paulo. Feed: propylene. Product: polypropylene (130,000 mt/y).

POLIBUTENOS SA INDUSTRIAS QUIMICAS

São Paulo. Feed: isobutylene. Product: polyisobutylene (15,000 mt/y).

POLIOLEFINAS SA

Capuava, Santo André. Feed: ethylene, vinyl acetate. Product: ethylene-vinyl acetate copolymer and ld polyethylene (110,000 mt/y).

Triunfo, Rio Grande do Sul. Feed: ethylene. Product: ld polyethylene (160,000 mt/y).

POLISUL PETROQUIMICA SA

(33% Hoechst AG, 33% Ipiranga, 33% petroquisa)
Triunfo. Feed: ethylene. Product: hd polyethylene (160,000 mt/y).

POLITENO

Camacari, Bahia. Feed: ethylene, vinyl acetate. Product: ld polyethylene (135,000 mt/y).

PROMOR PETROQUIMICA SA

Camacari. Feed: methanol, natural gas, paraxylene, toluene. Products: dimethyl terephthalate (78,000 mt/y), toluene di-isocyanate (42,000 mt/y).

PROSINT PRODUTOS SINTÉTICOS SA

Rio de Janeiro. Feed: natural gas. Product: methanol (42,500 mt/y).

RHODIA SA

Paulínia. Feed: alcohol, cumene, paraxylene. Products: acetaldehyde (58,500 mt/y), acetic acid (73,000 mt/y), acetone (71,000 mt/y), bisphenol A (17,900 mt/y), cyclohexane (400 mt/y), isopropanol (7,700 mt/y), phenol (115,000 mt/y), terephthalic acid (110,000 mt/y).

Santo André. Feed: alcohol. Product: acetic anhydride (26,000 mt/y).

SALGEMA SA

Maceió, Alagoas. Feed: alcohol. Products: ethylene dichloride (420,000 mt/y), ethylene (100,000 mt/y).

SOLVAY DO BRASIL

Santo André. Feed: ethylene, vinyl chloride. Products: hd polyethylene (82,000 mt/y), polyvinyl chloride (156,000 mt/y), vinyl chloride (34,000 mt/y).

ULTRAFÉRTIL SA

Araucária. Feed: anhydrous ammonia, asphaltic residue, syngas. Product: ammonia (396,000 mt/y).

Piaçaguera. Feed: naphtha, refinery off gases. Product: ammonia (149,820 mt/y).

UNION CARBIDE DO BRASIL LTDA

Cubatão, São Paulo. Feed: ethylene. Products: ethanol (92,000 mt/y), ethylene (40,000 mt/y), ld polyethylene (128,000 mt/y).

USIMINAS SA

(Usinas Siderúrgicas de Minas Gerais)

Ipatinga. Feed: coke oven gas, coal tar. Products: ammonia (12.3 mt/d), benzene (33.3 mt/d), naphthalene (19 mt/d), toluene (5.3 mt/d), xylene mix (0.7 mt/d).

BULGARIA

NEFTOCHIM

Bourgas. Product: acetaldehyde (90,000 mt/y), acetone (25,000 mt/y), acrylonitrile (30,000 mt/y), benzene (20,000 mt/y), butadiene (50,000 mt/y), butanol (10,000 mt/y), cumene (63,000 mt/y), ethylbenzene (38,000 mt/y), ethylene (250,000 mt/y), ethylene glycol (110,000 mt/y), ethylene oxide (80,000 mt/y), oxoalcohols (20,000 mt/y), normal paraffins (120,000 mt/y), phenol (40,000 mt/y), propylene (160,000 mt/y), styrene (40,000 mt/y), toluene (63,000 mt/y), orthoxylene (19,000 mt/y), paraxylene (16,000 mt/y), xylene mix (3,500 mt/y),

polyethylene (100,000 mt/y), polypropylene (80,000 mt/y), polystyrene (25,000 mt/y), SBR (30,000 mt/y), pyrolysis gasoline (200,000 mt/y), fuel oils (45,600 mt/y).

CANADA

ALBERTA GAS ETHYLENE CO. LTD.

Joffre, Alberta. Feed: ethane. Products: ethylene (1,457,000 mt/y), propylene (45,000 mt/y).

BASF CANADA INC.

Cornwall, Ontario. Feed: orthoxylene. Products: phthalic anhydride (40 mt/y), plasticizers (30 mt/y).

B.F. GOODRICH CANADA INC.

Fort Saskatchewan, Alberta. Product: polyvinyl chloride (100,000 mt/y).

Niagara Falls, Ontario. Product: polyvinyl chloride resins (95,000 mt/y).

Scottford, Alberta. Product: polyvinyl chloride resins.

Shawinigan, Quebec. Product: polyvinyl chloride resins (57,000 mt/y).

BORDEN CHEMICAL CANADA

Laval, Quebec. Feed: methanol. Product: formaldehyde (25,000 mt/y).

Edmonton, Alberta. Feed: methanol. Product: formaldehyde (35,000 mt/y).

GE PLASTICS CANADA LTD.

Cobourg, Ontario. Product: ABS (30,000 mt/y).

CABOT CANADA LTD.

Sarnia, Ontario. Feed: heavy fuel oil. Product: carbon black (80,000 mt/y).

CANADIAN FERTILIZERS LTD.

Medicine Hat, Alberta. Feed: natural gas. Product: ammonia (890,000 mt/y), urea (595,000 mt/y).

CANCARB LTD.

Medicine Hat, Alberta. Feed: natural gas. Product: carbon black (30,000 mt/y).

CELANESE CANADA LTD.

Clover Bar (near Edmonton). Feed: butanes, ethylene, natural gas. Products: acetaldehyde (1,700 mt/y), acetic acid (72,000 mt/y), acetic anhydride (27,000 mt/y), acetone (1,200 mt/y), formaldehyde (38,000 mt/y), methanol (765,000 mt/y), vinyl acetate (52,000 mt/y).

C-I-L INC.

Courtright, Ontario. Feed: natural gas. Product: ammonia (720,000 mt/y), urea (140,000 mt/y).

Edmonton, Alberta. Feed: ethylene. Product: ld polyethylene, ethylene vinyl acetate (75,000 mt/y).

COLUMBIAN CHEMICALS CO.

Hamilton, Ontario. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (30,660 mt/y).

COMINCO FERTILIZERS.

Carseland, Alberta. Feed: natural gas. Product: ammonia (410,000 mt/y), urea (575,000 mt/y).

Joffre, Alberta. Feed: nitrogen, hydrogen. Product: ammonia (350,000 mt/y).

COMMERCIAL ALCOHOLS LTD.

Varennes, Quebec. Feed: ethylene. Product: ethanol (55,000 mt/y).

CYANAMID CANADA INC.

Niagara Falls, Ontario. Feed: natural gas. Products: ammonia (210,000 mt/y).

DOW CHEMICAL CANADA INC.

Fort Saskatchewan, Alberta. Feed: ammonia, caustic, chlorine, ethylene, hydrogen, natural gas, oxygen. Products: ethanalamines, ethylene dichloride, ethylene glycol, ethylene oxide, ld polyethylene, vinyl chloride.

Sarnia, Ontario. Feed: benzene, butadiene, caustic, chlorine, ethylene, hydrogen, natural gas, propylene. Products: ethylbenzene, ld and hd poly-

ethylene, polystyrene, propylene glycol, propylene oxide, styrene, vinyl chloride, SB latex.

Varennes, Quebec. Feed: butadiene, styrene. Product: SB latex.

DU PONT CANADA INC.

Corunna, Ontario. Feed: ethylene. Product: ld & hd polyethylene (235,000 mt/y).

ESSO CHEMICAL CANADA

(Division of Imperial Oil)

loco, B.C. Feed: naphtha. Product: xylene (7,000 mt/y).

Redwater, Alberta. Feed: natural gas. Products: ammonia (825,000 mt/y), urea (525,000 mt/y).

Sarnia, Ontario. Feed: natural gas liquids, refinery off gases. Products: benzene (100,000 mt/y), butadiene (8,000 mt/y), butylenes (40,000 mt/y), carbon black (65,005 mt/y), ethylene (220,000 mt/y), polyethylene (135,000 mt/y), polyvinyl chloride (90,000 mt/y), propylene (40,000 mt/y), toluene (70,000 mt/y), xylene (30,000 mt/y).

ETHYL CANADA INC.

Corunna, Ontario. Feed: ethylene, anhydrous hydrogen chloride. Product: ethylchloride (30,000 mt/y).

HIMONT CANADA INC.

Varennes, Quebec. Feed: propylene. Product: polypropylene (135,000 mt/y).

NITROCHEM INC.

Maitland, Ontario. Feed: natural gas. Products: ammonia (90,000 mt/y).

NOVA PETROCHEMICALS INC.

Cambridge, Ontario. Feed: styrene. Product: polystyrene (33,700 mt/y).

Corunna, Ontario. Feed: heavy atm. gas oil, vac gas oil, naphtha LPG. Products: aromatics (265,000 mt/y), benzene (140,000 mt/y), butadiene (70,000 mt/y), ethylene (550,000 mt/y), propylene (330,000 mt/y), toluene (125,000 mt/y).

Montreal. Feed: styrene. Product: polystyrene (33,700 mt/y).

Sarnia, Ontario. Feed: benzene, C₈ streams, ethylene. Products: butadiene (100,000 mt/y), butylenes (130,000 mt/y), styrene (385,000 mt/y).

Joffre, Alberta. Feed: ethane. Product: propylene (44,000 mt/y), butadiene (46,000 mt/y), pyrolysis gasoline (59,000 mt/y), ld polyethylene (295,000 mt/y).

Medicine Hat, Alberta. Feed: natural gas. Product: methanol (860,000 mt/y).

OCELOT AMMONIA CO.

Klittmat, B.C. Feed: natural gas. Products: ammonia (550 mt/d), methanol (1,200 mt/d).

PETRO-CANADA PRODUCTS

Montreal. Feed: crude oil. Products: benzene (115,000 mt/y), toluene (110,000 mt/y), xylene mix (115,000 mt/y).

RECOCHEM INC.

Montreal, Quebec. Products: benzene, naphthalene, toluene, xylene.

REICHHOLD LTD.

North Bay, Ontario. Feed: methanol. Product: formaldehyde (100,000 mt/y).

Port Moody, B.C. Feed: methanol. Product: formaldehyde (15,500 mt/y).

Ste. Therese, Quebec. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Thunder Bay, Ontario. Feed: methanol. Products: formaldehyde (55,000 mt/y).

SHELL CANADA LTD.

Corunna, Ontario. Feed: reformate, propylene. Products: benzene (347,000 mt/y), polypropylene (170,000 mt/y), toluene (87,000 mt/y), xylene mix (73,000 mt/y).

Montreal East, Quebec. Feed: isopropyl alcohol. Product: acetone, C₈, oxysolvents (27,000 mt/y).

Scottford, Alberta. Feed: benzene, ethylene. Product: styrene (380,000 mt/y).

SHERITT GORDON MINES LTD.

Fort Saskatchewan, Alberta. Feed: natural gas. Products: ammonia (490,000 mt/y), urea (393,000 mt/y).

SIMPLOR CHEMICAL CO. LTD.

Brandon, Man. Feed: natural gas. Products: ammonia (600 mt/d), urea (500 mt/d).

SUNOCO INC.

Sarnia. Feed: crude. Products: benzene (60,000 mt/y), orthoxylene (30,000 mt/y), toluene (200,000 mt/y), xylene mix (160,000 mt/y).

UNION CARBIDE CANADA LTD.

Montreal East, Quebec. Feed: ethylene. Products: ethylene glycol (82,000 mt/y), ethylene oxide (80,000 mt/y).

Red Deer, Alberta. Product: ethylene glycol (250 mt/d).

CHILE

CAPE HORN METHANOL INC.

Punta Arenas. Feed: natural gas. Product: methanol (750,000 mt/y).

PETROX SA

Talcahuano. Feed: naphtha. Product: ethylene (60,000 mt/y).

CHINA

CHINA PETRO-CHEMICAL INTERNATIONAL

Lanzhou, Gansu Province. Feed: naphtha, gas oils. Product: ethylene (80,000 mt/y).

CHINA, TAIWAN

ARCO CHEMICAL

Kaohsiung. Products: polyols (30,500 mt/y), propylene glycols (10,000 mt/y).

CHANG CHUN PETROCHEMICAL CO. LTD.

Miaoli. Feed: acetic acid, n-isobutanol, vinyl acetate. Products: acetic acid (60,000 mt/y), polyvinyl alcohol (60,000 mt/y).

CHANG CHUN PLASTICS CO. LTD.

Kaohsiung. Feed: acrylonitrile, methanol, phenol, urea. Products: acrylamide (6,600 mt/y), formaldehyde (33,000 mt/y), polyacrylamide (18,000 mt/y), polyester (2,400 mt/y).

Shin-Chu. Feed: acetone, bisphenol, methanol, phenol. Products: formaldehyde (50,000 mt/y), paraformaldehyde (9,000 mt/y), resin (12,000 mt/y).

CHINA AMERICAN PETROCHEMICAL CO. LTD.

Lin Yuan. Feed: paraxylene. Product: terephthalic acid (1,000,000 mt/y).

CHINA PETROCHEMICAL DEVELOPMENT

CORP. Kaohsiung. Feed: cyclohexane, oleum. Products: caprolactam (50,000 mt/y).

Ta-She. Feed: ammonia, propylene, syngas. Product: acetic acid (60,000 mt/y), acrylonitrile (132,000 mt/y), methanol (66,000 mt/y).

Toufen. Feed: benzene, oleum. Product: caprolactam (50,000 mt/y), ethylene, (54,000 mt/y).

CHINA SYNTHETIC RUBBER CORP.

(Licensee of Witco Corp.—Concarb Div.)

Kaohsiung. Feed: indigenous E.B. Product: carbon black (45,000 mt/y).

CHINESE PETROLEUM CORP.

Kaohsiung. Feed: crude. Products: benzene (318,500 mt/y), butadiene (128,000 mt/y), ethylene (899,000 mt/y), orthoxylene (60,000 mt/y), paraxylene (200,000 mt/y), propylene (475,600 mt/y), toluene (19,500 mt/y).

CHIUNGLONG PETROCHEMICAL CO. LTD.

Kaohsiung. Products: polypropylene glycol (22,000 mt/y), propylene glycol (5,560 mt/y), propylene oxide (15,000 mt/y).

DAIREN CHEMICAL CORP.

Kaohsiung. Feed: acetic acid, ethylene. Products: ethyl acetate (30,000 mt/y), ethylene vinyl acetate emulsion (23,000 mt/y), vinyl acetate (100,000 mt/y).

FORMOSA PLASTICS CORP.

Kaohsiung. Products: acrylic acid-esters (75,000 mt/y), hd polyethylene (120,000 mt/y), polyvinyl chloride (840,000 mt/y), acrylics staple fiber (110,000 mt/y).

FORMOSAN UNION CHEMICAL CORP.

Lin Yuan. Feed: benzene, n-olefin, propylene tetramer. Product: alkylbenzene (90,000 mt/y).

GRAND PACIFIC PETROCHEMICAL CORP.

Ta-She, Kaohsiung. Feed: benzene, ethylene. Products: ABS (50,000 mt/y), styrene (200,000 mt/y), polystyrene (23,000 mt/y).

HO TUNG CHEMICAL CORP.

Jen-Wu, Kaohsiung. Feed: kerosine. Product: normal paraffins (40,000 mt/y).

LEE CHANG YUNG CHEMICAL INDUSTRY

CORP. Hsinchu. Feed: natural gas. Products: methanol (60,000 mt/y).

Kaohsiung. Feed: methanol. Products: formaldehyde (120,000 mt/y).

Lin-Yuan. Feed: isopropyl alcohol, propylene. Products: acetone (20,000 mt/y), isopropanol (30,000 mt/y).

ORIENTAL UNION CHEMICAL CORP.

Kaohsiung. Feed: ethylene. Products: ethylene glycol (150,000 mt/y), ethylene oxide (117,000 mt/y).

TAIWAN FERTILIZER CO. LTD.

Miaoli. Feed: natural gas. Products: ammonia (332,150 mt/y), urea (335,800 mt/d).

TAIWAN POLYPROPYLENE CO. LTD.

Kaohsiung. Feed: propylene. Product: polypropylene (180,000 mt/y).

TAIWAN SYNTHETIC RUBBER CORP.

Ta-She, Kaohsiung. Feed: butadiene, styrene. Products: polybutadiene (40,000 mt/y), thermoplastic elastomer (20,000 mt/y), SBR (100,000 mt/y).

USI FAR EAST CORP.

Kaohsiung. Feed: ethylene. Product: hd polyethylene (80,000 mt/y), ld polyethylene (140,000 mt/y), lld polyethylene (120,000 mt/y).

COLOMBIA

AMONIAO DEL CARIBE SA

Cartagena. Feed: natural gas. Product: ammonia (350 mt/d).

CABOT COLOMBIANA SA

(subsidiary of Cabot Corp., Waltham, Mass.)

Mamonal, Cartagena. Feed: aromatic tar, natural gas. Product: carbon black (20,000 mt/y).

CARBOQUIMICA SA.

Bogota. Feed: aromatics, coal tar. Products: naphthalene (2,000 mt/y), phthalic anhydride (8,000 mt/y), plasticizers (20,000 mt/y), solvents (5,000 mt/y).

DOW COLOMBIANA SA

Cartagena. Feed: styrene. Product: polystyrene (31,000 mt/y).

EMPRESA COLOMBIANA DE PETROLEOS

Barrancabermeja. Feed: crude oil, natural gas. Products: alkylbenzene (21,000 mt/y), aromatics (55,000 mt/y), benzene (11,200 mt/y), cyclohexane (34,000 mt/y), ethylene (100,000 mt/y), orthoxylene (19,000 mt/y), propylene (3,900 mt/y), toluene (22,000 mt/y), xylene mix (18,000 mt/y), polyethylene (57,000 mt/y).

PETROQUIMICA DE VENEZUELA SA

(Pequiven)

Barranquilla. Feed: ammonia, sulfur, ciclo hexano. Product: caprolactam (23,500 mt/y).

PETROQUIMICA COLOMBIANA SA

Mamonal, Cartagena. Feed: vinyl chloride. Products: polyvinyl chloride (120,000 mt/y).

POLICOLSA (owned by Ecopetrol)

Barrancabermeja. Feed: ethylene. Product: ld polyethylene (55,000 mt/y).

PRODUCTOS PETROQUIMICOS

Yumbo, Valle. Feed: aromatic tar. Product: carbon black (18,000 mt/y).

CZECHOSLOVAKIA

CHEMICKÉ WORKS LITVINOV

Litvinov. Feed: crude oil. Product: ammonia (329,000 mt/y), benzene (168,000 mt/y), carbon black (900 mt/y), ethanol (56,000 mt/y), ethylbenzene (115,000 mt/y), ethylene (388,000 mt/y), oxoalcohols (48,000 mt/y), phenol (6,000 mt/y), propylene (190,000 mt/y), toluene (21,000 mt/y), urea (197,000 mt/y), xylene mix (28,000 mt/y), polyethylene (116,000 mt/y), polypropylene (117,000 mt/y).

CHEMICKÉ ZAVODY SOKOLOV as

Sokolov. Feed: propylene. Product: acrylic acid and esters (30,000 mt/y), acrylics (30,000 mt/y).

DUSLO sp

Sala. Feed: natural gas. Product: acetaldehyde (21,000 mt/y), acetic acid (23,000 mt/y), acetylene (15,000 mt/y), ammonia (500,000 mt/y), urea (300,000 mt/y), vinyl acetate (16,000 mt/y).

KAUCUK sp

Kralupy. Feed: crude oil, c4-cut, ethylbenzene. Product: butadiene (90,000 mt/y), styrene (105,000 mt/y), ABS (9,000 mt/y), polystyrene (80,000 mt/y), SBR (75,000 mt/y).

POVAZSKÉ CHEMICKÉ ZAVODY SE

Zilina. Product: acrylic acid and esters (6,000 mt/y), caprolactam (28,000 mt/y), acrylics (4,000 mt/y), polyamide (4,000 mt/y).

SLOVNAFT sp

Bratislava. Feed: ethylene, propylene, naphtha. Product: acetic anhydride (22,000 mt/y), benzene (85,000 mt/y), cumene (50,000 mt/y), dimethyl terephthalate (16,000 mt/y), ethylbenzene (40,000 mt/y), ethylene (260,000 mt/y), ethylene glycol (60,000 mt/y), ethylene oxide (15,000 mt/y), oxoalcohols (55,000 mt/y), phenol (35,000 mt/y), propylene (110,000 mt/y), terephthalic acid (15,000 mt/y), orthoxylene (10,000 mt/y), paraxylene (40,000 mt/y), xylene (50,000 mt/y), polyethylene (168,000 mt/y), polypropylene (70,000 mt/y).

SPOLANA

Spolana Neratovice. Product: caprolactam (45,000 mt/y), vinyl chloride (120,000 mt/y), polyvinyl chloride (120,000 mt/y).

URXOVY ZAVODY SP

Urxovy Zavody. Feed: coal, tar, raw benzol. Product: aromatics mix (8,000 mt/y), benzene (100,000 mt/y), carbon black (56,000 mt/y), naphthalene (40,000 mt/y), phenol (3,000 mt/y), phthalic anhydride (25,000 mt/y), toluene (27,000 mt/y), xylene (10,500 mt/y).

ECUADOR

CIA. QUIMICA BORDEN EQUATORIANA SA

Quito. Feed: methanol. Product: formaldehyde (9,400 mt/y).

EGYPT

AMERIA PETROLEUM REFINING CO.

Ameria. Feed: naphtha. Products: alkylbenzene (40,000 mt/y), benzene (23,000 mt/y), toluene (4,000 mt/y).

EGYPTIAN PETROCHEMICAL CO.

Ameria. Feed: imported ethylene, sodium chloride. Products: polyvinyl chloride (80,000 mt/y), vinyl chloride (100,000 mt/y).

EL NASR d'ENGRAIS et d'INDUSTRIES CHIMIQUES.-Suez-Attaka. Feed: natural gas. Product: ammonia (250 t/d).

Talkha. Feed: natural gas. Products: ammonia (396 t/d), urea (570,000 mt/y).

FINLAND**KEMIRA OY**

Oulu. Feed: peat. Products: ammonia (80,000 mt/y), formic acid (35,000 mt/y), urea (90,000 mt/y).

NESTE OY

Kokemaki. Feed: styrene. Product: polystyrene (10,000 mt/y).

Porvoo. Feed: alcohols, benzene, cumene, ethylene, FCC gas, glycols, LPG, naphtha, orthoxylene, refinery gases, styrene, vinyl chloride monomer. Products: acetone (50,000 mt/y), benzene (110,000 mt/y), butadiene (20,000 mt/y), cumene (140,000 mt/y), ethylene (230,000 mt/y), phthalic anhydride (20,000 mt/y), plasticizers (11,000 mt/y), polyester (15,000 mt/y), Id polyethylene (180,000 mt/y), polystyrene (35,000 mt/y), polypropylene (120,000 mt/y), polyvinyl chloride (80,000 mt/y), propylene (170,000 mt/y).

FRANCE**AMMONIAC DE GRAND QUEVILLY**

(62.5% Grande Paroisse, 37.5% Hydro Azote)

Grand Quevilly. Feed: natural gas. Product: ammonia (1,000 mt/d).

AMMONIAC DE GRAND QUEVILLY 2

(51% Grande Paroisse, 10% Rhone Poulenc)

Grand Quevilly. Feed: natural gas. Product: ammonia (1,000 mt/d).

APPRYL

(51% Atochem, 49% BP Chemicals)

Gonfreville. Product: polypropylene (150,000 mt/y).

Lavera. Product: polypropylene (200,000 mt/y).

ARCO CHEMICAL

Fos-sur-Mer. Products: MTBE (14,500 b/d), propylene glycols (80,000 mt/y), propylene oxide (220,000 mt/y), tertiary butyl alcohol (550,000 mt/y), polyols (110,000 mt/y).

ATOICHEM

Balan (Ain). Products: Id polyethylene (90,000 mt/y), Id polyethylene (35,000 mt/y), polyvinyl chloride (180,000 mt/y).

Brignoud. Product: polyvinyl chloride (115,000 mt/y).

Carling-St. Avoird-Marienau. Feed: benzols, gazole, naphtha, acetone, alcohols, ammonia, propylene, coal tar. Products: acrylic acid (220,000 mt/y), benzene (335,000 mt/y), cyclohexane (70,000 mt/y), ethylbenzene (310,000 mt/y), ethylene (440,000 mt/y), naphthalene, phenols, propylene (235,000 mt/y), styrene (300,000 mt/y), polystyrene (100,000 mt/y).

Chaunay. Feed: naphthalene, orthoxylene. Products: phthalic anhydride (75,000 mt/y), plasticizers (70,000 mt/y).

Dieuze. Feed: styrene. Product: polystyrene (110,000 mt/y).

Feyzin. Feed: LPG, naphtha. Products: benzene (110,000 mt/y), butadiene (40,000 mt/y), ethylene (144,000 mt/y), propylene (122,000 mt/y), toluene (23,000 mt/y).

Gonfreville l'Orcher. Feed: LPG, naphtha. Products: benzene (170,000 mt/y), butadiene (65,000 mt/y), ethylene (475,000 mt/y), ethylbenzene (400,000 mt/y), Id polyethylene (80,000 mt/y), Id polyethylene (160,000 mt/y), polyethylene bd/hd (110,000 mt/y), polystyrene (160,000 mt/y), propylene (245,000 mt/y), styrene (350,000 mt/y).

La Chambre (Savoie). Feed: acetone, ethanol,

2-butanol, isopropanol. Product: solvents (85,000 mt/y), alkylamines (25,000 mt/y).

Lacq (Snea plant). Feed: ethane. Products: benzene (60,000 mt/y), ethylbenzene (55,000 mt/y), ethylene (75,000 mt/y), styrene (50,000 mt/y).

Lavera. Feed: LPG, naphtha. Products: butadiene (60,000 mt/y), benzene (85,000 mt/y), chloromethanes (120,000 mt/y), ethylene (335,000 mt/y), propylene (225,000 mt/y), vinyl chloride (420,000 mt/y).

Mont (near Lacq). Feed: ammonia, ethylene, vinyl acetate. Product: Id polyethylene with EVA copolymers (75,000 mt/y).

Notre Dame de Gravenchon (Seine Maritime). Feed: n-butenes. Product: 2-butanol (50,000 mt/y).

Port de Bouc, Fos. Product: vinyl chloride (250,000 mt/y).

Ribecourt. Feed: styrene. Product: polystyrene (55,000 mt/y), expandable polystyrene (75,000 mt/y).

Saint Auban. Products: polyvinyl chloride (130,000 mt/y), solvents (160,000 mt/y).

Saint Fons, Rhone. Product: polyvinyl chloride (175,000 mt/y), vinyl compound (60,000 mt/y).

Serquigny. Product: polyamides (25,000 mt/y).

Toulouse. Product: formaldehyde (25,000 mt/y), melamine (16,000 mt/y).

Villiers Saint Paul (Oise). Feed: benzene. Product: maleic anhydride (23,000 mt/y), formaldehyde

AZOLACQ

(64% Grande Paroisse, 36% Hydro Azote)

Oissel. Feed: ammonia, carbon dioxide. Product: urea (360 mt/d).

BAYER ELASTOMÈRES

Lillebonne. Feed: butadiene, styrene. Products: polybutadiene (57,000 mt/y), SBR (6,000 mt/y), SBR latex (24,000 mt/y).

BORG WARNER

Villiers Saint Sepulcre (Oise). Product: ABS (50,000 mt/y).

BP CHEMICALS LTD.

Wingles. Products: polystyrene (110,000 mt/y), expandable polystyrene (44,000 mt/y).

BP CHIMIE

Lavera, Martigues. Feed: GPL, naphtha. Products: benzene (60,000 mt/y), butadiene (50,000 mt/y), ethylene (250,000 mt/y), ethylene glycol (165,000 mt/y), ethylene oxide (150,000 mt/y), polyisobutylene (50,000 mt/y), polyethylene (160,000 mt/y), propylene (180,000 mt/y).

CIE. CHIMIQUE DE LA MEDITERRANEE SA

(Shell 50%, BASF 50%)

Berre l'Etang. Feed: ethylene. Product: Id polyethylene (110,000 mt/y).

CRD-TOTAL FRANCE

Gonfreville l'Orcher. Feed: crude. Products: benzene (70,000 mt/y), polybutene (20,000 mt/y), polypropylene (40,000 mt/y), toluene (20,000 mt/y).

CIE. DU POLYISOPRENE SYNTHETIQUE

Oudalle. Feed: C-5's, isoprene. Products: isoprene-azeotrope (45,000 mt/y), polyisoprene (45,000 mt/y).

COPENOR-GIE

(30% Atochem)

Dunkerque. Feed: naphtha, gazole, LPG. Products: ethylene (96,000 mt/y), propylene (48,000 mt/y).

DEGUSSA

Ambès. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

GRANDE PAROISSE

Toulouse. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (150,000 mt/y).

Waziers. Feed: natural gas. Product: ammonia (520 mt/d).

ICI LTD.

Balcourt. Product: plasticizers (75,000 mt/y).

NOROXO

(100% CdF Chimie)

Harnes (Pas-de-Calais). Feed: olefins. Products: oxoalcohols (115,000 mt/y), oxoacids (20,000 mt/y).

NORSK HYDRO AZOTE

Le Havre, Pardies, Rouen, Pierrefitte. Feed: gas. Products: ammonia (730,000 mt/y), urea (190,000 mt/y).

OXOCHIMIE.

(50% Atochem, 50% BP Chimie)

Lavera. Product: oxoalcohols (200,000 mt/y).

PEC-RHIN

(50% Grande Paroisse, 50% BASF).

Ottmarshelm. Feed: natural gas. Product: ammonia (180,000 mt/y).

PETROSYNTHESA SA

(100% Chevron Chemical Co.)

Gonfreville. Feed: benzene, propylene. Product: alkylbenzene (100,000 mt/y).

POLYSAR FRANCE SA.

Strasbourg. Feed: acrylonitrile, benzene, butadiene, ethylene. Products: SBR latex, nitrile rubber (160,000 mt/y).

RESINOPLAST

(100% Atochem)

Reims. Product: polyvinyl chloride compounds (50,000 mt/y).

RHONE POULENC

Belle-Etoile. Feed: paraxylene, methanol. Product: dimethyl terephthalate (70,000 mt/y).

Pardies. Feed: natural gas, methanol. Products: acetic acid (330,000 mt/y), acetylene (50,000 mt/y), vinyl acetate (160,000 mt/y).

Pont de Claix. Feed: phenol, acetone. Product: bisphenol A (60,000 mt/y).

Roussillon. Feed: acetic acid, benzene, propylene. Products: acetic anhydride (80,000 mt/y), acetone (60,000 mt/y), cumene (190,000 mt/y), phenol (100,000 mt/y).

SHELL CHIMIE

Berre l'Etang. Feed: gas oil, LPG, naphtha. Products: benzene (60,000 mt/y), butadiene (80,000 mt/y), ethylene (420,000 mt/y), isopropanol (110,000 mt/y), Id polyethylene (110,000 mt/y), polybutadiene (50,000 mt/y), polypropylene (135,000 mt/y), polystyrene (55,000 mt/y), polyvinyl chloride (205,000 mt/y), propylene (210,000 mt/y), toluene (12,000 mt/y).

SOCABU-SOCIETE DU CAOUTCHOUC BUTYL

Notre Dame de Gravenchon. Feed: refinery products. Products: butyl rubber (52,000 mt/y), ethylene-propylene rubber (50,000 mt/y).

SOCIÉTÉ ARTESIANNE DE VINYLE

(DSM subsidiary)

Mazingarbe. Product: polyvinyl chloride (195,000 mt/y).

SOCIÉTÉ DES ENGRAIS DE L'ILE DE FRANCE

(86% Grande Paroisse, 14% Rhone Poulenc)

Grandpuits. Feed: natural gas. Product: ammonia (1,150 mt/y).

SOCIÉTÉ DU CHLORURE DE VINYLE DE FOS

(60% Shell Chimie, 40% Atochem)

Fos sur Mer (Bouches du Rhône). Feed: chlorine, ethylene. Product: vinyl chloride (350,000 mt/y).

SOCIÉTÉ DU POLYETHYLENE DE FOS

(100% Shell)

Fos sur Mer (Bouches du Rhône). Feed: ethylene. Product: Id polyethylene (100,000 mt/y).

SOCIÉTÉ FRANCAISE EXXON CHEMICAL

Notre Dame de Gravenchon. Feed: refinery products. Products: butadiene (70,000 mt/y), ethylene (300,000 mt/y), propylene (220,000 mt/y), solvents (60,000 mt/y).

SOCIÉTÉ FRANCAISE HOECHST

LaMotte. Feed: methanol. Product: formaldehyde (12,000 mt/y).

Lillebonne. Feed: ethylene, propylene. Product: acetaldehyde (98,000 mt/y), polypropylene (120,000 mt/y).

SOCIÉTÉ NORMANDE DE L'AZOTE

Gonfreville. Feed: naphtha, natural gas. Products: ammonia (330,000 mt/y), urea (250,000 mt/y).

SODES—Société d'Éthanol de Synthèse

(23.5% Atochem, 34% SFECI, 31% Beghin Say)
Lillebonne. Product: ethanol (120,000 mt/y), ether (10,000 mt/y).

SOLVAY SA.

Sarrelaube. Feed: ethylene, propylene. Products: hd polyethylene, polypropylene.

Tavaux. Feed: ethylene. Products: polyvinyl chloride, vinyl chloride, vinylidene chloride, polyvinylidene chloride, vinylidene fluoride and polyvinylidene.

UNITED CHEMICAL FRANCE

Port Jerome. Feed: aromatic oils. Product: carbon black (88,000 mt/y).

GERMANY**ATOCHM DEUTSCHLAND GmbH.**

Bonn. Product: polyamide.

BASF AG

Ludwigshafen. Feed: fuel oil, naphtha, natural gas. Products: acetic acid (40,000 mt/y), acetylene (85,000 mt/y), acrylic acid (210,000 mt/y), ammonia (700,000 mt/y), butanols (220,000 mt/y), caprolactam (150,000 mt/y), ethylbenzene (350,000 mt/y), ethylene (450,000 mt/y), ethylene oxide (150,000 mt/y), formaldehyde (1,200,000 mt/y), melamine (40,000 mt/y), methanol (240,000 mt/y), higher oxoalcohols (100,000 mt/y), 2-ethylhexanol (150,000 mt/y), phthalic anhydride (90,000 mt/y), polyamide (worldwide—105,000 mt/y), ld polyethylene (18,000 mt/y), polyisobutylene (6,000 mt/y), polypropylene (10,000 mt/y), polystyrene (315,000 mt/y), polyvinyl chloride (150,000 mt/y), propanol (25,000 mt/y), propylene (240,000 mt/y), propylene glycol (40,000 mt/y), propylene oxide (75,000 mt/y), styrene (500,000 mt/y), urea (480,000 mt/y), vinyl chloride (100,000 mt/y), plasticizers (220,000 mt/y).

BAYER AG

Dormagen. Products: acrylonitrile-butadiene-styrene (115,000 mt/y), polyamide (50,000 mt/y).
Uerdingen. Products: bisphenol A (707,000 mt/y), formaldehyde (95,000 mt/y), maleic anhydride (12,000 mt/y), phthalic anhydride (60,000 mt/y), SBR (45,000 mt/y).

BP BENZIN UND PETROLEUM AG UND CALIFORNIA CHEMICAL GmbH oHG.

(owned jointly by Chevron Chemical Company and BP Benzin und Petroleum AG)

Dinslaken. Feed: reformate. Products: orthoxylene (24,000 mt/y), paraxylene (20,000 mt/y).

COLUMBIAN CARBON DEUTSCHLAND

Hamburg. Feed: oil. Product: carbon black (13,103 mt/y).

Hannover. Product: carbon black (19,053 mt/y).

CONDEA CHEMIE GmbH

(owned by Conoco Inc. and Deutsche Texaco AG)
Brunsbüttel. Feed: ethylene, hydrogen. Product: synthetic straight chain primary fatty alcohols (75,000 mt/y).

DEGUSSA AG

Bruchhausen. Feed: methyl alcohol. Product: formaldehyde.

Kalscheuren. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

Mainz-Mombach. Feed: methyl alcohol. Product: formaldehyde.

DEUTSCHE EXXON CHEMICAL GmbH

Cologne. Feed: raffinate 1, (spent butanes). Products: butylenes (35,000 mt/y), polyisobutylene (45,000 mt/y).

DMP MINERALOL PETROCHEMIE GmbH

(subsidiary of OMV AG)

Burghausen, Bavaria. Feed: refinery streams. Products: aromatics (120,000 mt/y), benzene (120,000 mt/y), butadiene-C₄ cut (90,000 mt/y), ethylene (280,000 mt/y), propylene (140,000 mt/y), polypropylene (120,000 mt/y).

DEUTSCHE SHELL AG

Cologne-Godorf. Feed: pyrolysis gasoline, reformate. Products: benzene (400,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (75,000 mt/y), toluene (220,000 mt/y).

DOW CHEMICAL

Rheinfuenster. Products: SB-latex, resins.

Stade. Products: bisphenol, propylene oxide, propylene glycol, resins, solvents.

EC ERDOLCHEMIE GmbH

(owned by Bayer AG and Deutsche BP AG)

Worringen, Cologne. Feed: naphtha. Products: acetylene (7,000 mt/y), acrylonitrile (280,000 mt/y), ammonia (330,000 mt/y), benzene (200,000 mt/y), butadiene (245,000 mt/y), butylenes (90,000 mt/y), ethanol (60,000 mt/y), ethylene (740,000 mt/y), ethylene glycol (150,000 mt/y), ethylene oxide (175,000 mt/y), propylene (520,000 mt/y), propylene glycol (40,000 mt/y), propylene oxide (150,000 mt/y), toluene (100,000 mt/y), polyethylene (300,000 mt/y).

EVC

(50% ICI, 50% Enichem)

Waldshut. Product: polyvinyl chloride (25,000 mt/y).

Wilhelmshaven. Product: vinyl chloride (320,000 mt/y), ethylene dichloride (300,000 mt/y).

HOECHST AG

Frankfurt. Feed: ethylene, propylene, natural gas. Products: acetaldehyde (130,000 mt/y), acetic acid (160,000 mt/y), hd polyethylene (149,000 mt/y), polyvinyl alcohol (25,000 mt/y), vinyl acetate (150,000 mt/y).

Gendorf. Feed: ethylene. Products: ethylene glycol (100,000 mt/y), ethylene oxide (120,000 mt/y), polyvinyl chloride (155,000 mt/y), vinyl chloride (160,000 mt/y).

Gersthofen. Feed: p-xylene, methanol. Product: dimethyl terephthalate (135,000 mt/y).

Keisterbach. Feed: olefins. Products: ethylene glycol-ethylene oxide (50,000 mt/y), polypropylene (130,000 mt/y).

Knapsack. Feed: olefins. Products: acetaldehyde (150,000 mt/y), acetic acid (70,000 mt/y), acetic anhydride (100,000 mt/y), polypropylene (90,000 mt/y), hd polyethylene (106,000 mt/y), polyvinyl chloride (105,000 mt/y), vinyl chloride (105,000 mt/y).

Muenchsmuenster. Feed: ammonia, ethylene, propylene. Products: acrylonitrile (90,000 mt/y), hd polyethylene (75,000 mt/y).

Oberhausen, Holfen. Feed: olefins. Products: hd polyethylene (80,000 mt/y), oxoalcohols (335,000 mt/y).

Offenbach. Feed: p-xylene, methanol. Product: dimethyl terephthalate (95,000 mt/y).

HÜLS

Marl. Products: acetaldehyde (80,000 mt/y), acetic acid (40,000 mt/y), acetylene (120,000 mt/y), alkylbenzene (80,000 mt/y), butanol-n-isobutanol (130,000 mt/y), cumene (140,000 mt/y), dimethyl terephthalate (410,000 mt/y), ethanol (130,000 mt/y), ethylbenzene (300,000 mt/y), ethylchloride (30,000 mt/y), ethylene (50,000 mt/y), ethylene dichloride (250,000 mt/y), ethylene glycol (90,000 mt/y), ethylene oxide (150,000 mt/y), isopropanol (75,000 mt/y), maleic anhydride (35,000 mt/y), oxoalcohols-octanol (200,000 mt/y), phthalic anhydride (150,000 mt/y), polyamide-12 (14,000 mt/y), polyester (34,000 mt/y), polyethylene

(160,000 mt/y), polypropylene (120,000 mt/y), polystyrene + EPS (205,000 mt/y), vinyl chloride (350,000 mt/y), polyvinyl chloride (380,000 mt/y), propylene glycol (22,000 mt/y), propylene oxide (27,000 mt/y), styrene (300,000 mt/y).

HÜLS TROISDORF AG

Luisdorf. Products: dimethyl terephthalate (150,000 mt/y), ethylene dichloride (85,000 mt/y).

Steyerberg. Product: dimethyl terephthalate (180,000 mt/y).

NORSK HYDRO RUHR

Brunsbüttel. Feed: heavy fuel oil. Products: ammonia (585,000 mt/y), urea (330,000 mt/y).

PHENOLCHEMIE GmbH

Gladbeck. Feed: cumene. Products: acetone (325,000 mt/y), phenol (500,000 mt/y).

PHILLIPS PETROLEUM INTERNATIONAL GmbH-Hannover.

Product: carbon black (50,000 mt/y).

RHEINISCHE OLEFINWERKE GmbH

(Shell 50%, BASF 50%)

Wesseling. Feed: gas oil, naphtha. Products: butadiene (150,000 mt/y), ethylene (650,000 mt/y), ethylbenzene (430,000 mt/y), ld polyethylene (400,000 mt/y), hd polyethylene (215,000 mt/y), polyisobutylene (8,000 mt/y), polypropylene (120,000 mt/y), propylene (310,000 mt/y), styrene (420,000 mt/y), SB rubber (30,000 mt/y), thermoplastic rubber (45,000 mt/y).

RUHR OEL GmbH

(50% Veba Oel AG, 50% Petróleos de Venezuela SA)

Gelsenkirchen. Feed: gas oil, naphtha, distill resid. Products: ammonia (400,000 mt/y), benzene (296,000 mt/y), cumene (330,000 mt/y), cyclohexane (100,000 mt/y), ethylene (440,000 mt/y), methanol (240,000 mt/y), orthoxylene (110,000 mt/y), n-paraffins (96,000 mt/y), paraxylene (120,000 mt/y), propylene (265,000 mt/y), toluene (90,000 mt/y), phthalic anhydride (63,000 mt/y).

Münchmünster. Feed: LPG, naphtha. Products: ethylene (200,000 mt/y), propylene (150,000 mt/y).

RWE—DEA AKTIENGESellschaft FÜR MINERALÖL UND CHEMIE

Heide. Feed: refinery products. Products: benzene (70,000 mt/y), butylenes (28,000 mt/y), ethylbenzene (11,000 mt/y), ethylene (80,000 mt/y), MTBE (12,500 mt/y), orthoxylene (15,000 mt/y), parametaxylene (38,000 mt/y), propylene (55,000 mt/y), toluene (130,000 mt/y).

Meerbeck und Duisburg. Feed: refinery products and chemicals. Products: acetone (36,000 mt/y), alkylbenzene (25,000 mt/y), alkyl chlorides (2,000 mt/y), isopropanol (140,000 mt/y), maleic anhydride (7,500 mt/y), plasticizers (24,000 mt/y), resins (36,000 mt/y), ketones (99,000 mt/y).

Wesseling. Feed: LPG, natural gas, pyrolysis gasoline, reformate, resid, refinery gas, xylene mix. Products: benzene (120,000 mt/y), ethylene (440,000 mt/y), methanol (400,000 mt/y), orthoxylene (32,000 mt/y), paraxylene (72,000 mt/y), propylene (260,000 mt/y), toluene (80,000 mt/y), xylene mix (62,000 mt/y).

SOLVAY KUNSTSTOFFE GmbH

Rheinberg. Feed: ethylene. Products: polyvinyl chloride, vinyl chloride.

WACKER-CHEMIE GmbH

Burghausen/Obb. Feed: ethylene. Products: acetaldehyde, acetic acid, acetic anhydride, ethylene dichloride, plasticizers, polyvinyl acetate, polyvinyl alcohol, polyvinyl chloride, vinyl acetate, vinyl chloride, solvents.

WINTERSHALL AG

Ibbenbüren. Feed: benzene, chlorine, n-paraffins. Product: alkylbenzene (36,000 mt/y).

Lingen-Ems. Feed: reformate, benzene-hydrogen, kerosine. Products: benzene (72,000 mt/y), cyclohexane (100,000 mt/y), normal paraffins (30,000 mt/y).

Mannheim. Feed: pyrolysis-gasoline, reformate. Product: benzene (270,000 mt/y).

GREECE

DOW CHEMICAL

Lavron. Product: polystyrene.

EKO CHEMICALS CO. AE

Thessaloniki. Feed: naphtha, refinery cuts, vinyl chloride. Products: ammonia (120,000 mt/y), ethylene (15,000 mt/y), ethylene dichloride (35,000 mt/y), normal paraffins (45,000 mt/y), polyvinyl chloride (70,000 mt/y).

HADJILUCAS SA

Halkia. Feed: methanol. Product: formaldehyde (20,000 mt/y).

HUNGARY

BORSODI VEGYI KOMBINÁT

Kazincbarcika. Feed: ethylene, natural gas. Products: ammonia (220,000 mt/y), ethylene dichloride (170,000 mt/y), polyamide (1,300 mt/y), polyvinyl chloride (190,000 mt/y), urea (120,000 mt/y), vinyl chloride (170,000 mt/y).

CHEMOKOMPLEX

Kazincbarcika. Product: vinyl chloride monomer (185,000 mt/y).

HUNGARIAN OIL AND GAS TRUST

Dunai Kőolajipari Váll. Product: aromatics mix (12,000 mt/y), benzene (100,000 mt/y), propylene (45,000 mt/y), toluene (120,000 mt/y), orthoxylene (41,000 mt/y), paraxylene (58,000 mt/y).

Százhalombatta. Feed: pyrolysis gasoline, reformate, vac gas oil (FCC unit). Products: benzene (110,000 mt/y), maleic anhydride (10,000 mt/y), orthoxylene (52,000 mt/y), propylene (42,000 mt/y), toluene (110,000 mt/y), xylene mix (48,000 mt/y).

TISZAI VEGYI KOMBINÁT

Leninváros. Feed: naphtha, natural gas. Products: ammonia (270,000 mt/y), aromatics (80,000 mt/y), benzene (80,000 mt/y), butylene (50,000), ethylene (300,000 mt/y), ld polyethylene (250,000 mt/y), polypropylene (190,000 mt/y), propylene (125,000 mt/y), pyrolysis gasoline (230,000 mt/y).

INDIA

ADARSH CHEMICALS & FERTILIZERS LTD.

Udhna, Gujarat. Feed: benzene. Product: maleic anhydride (4,485 mt/y).

AHMEDABAD MANUFACTURING & CALICO

PRINTING CO. LTD.-Baroda. Feed: dimethyl terephthalate, ethylene glycol. Product: polyester (7,968 mt/y).

BAKELITE HYLAM LTD.

Nacharam, Hyderabad. Feed: methanol. Product: formaldehyde (3,000 mt/y).

Sanathnagar, Hyderabad. Feed: phenol, formaldehyde, styrene, maleic-phthalic anhydride, isophthalic acid, propylene glycol. Products: phenolic resins (2,400 mt/y), polyester resins (1,800 mt/y).

BOMBAY DYEING AND MANUFACTURING CO.

LTD.-Bombay. Feed: paraxylene. Product: dimethyl terephthalate (60,000 mt/y).

BONGAIGAON REFINERY & PETROCHEMICALS LTD.-Dhaligaon, Assam.

Feed: reformer feed naphtha. Products: dimethyl terephthalate (45,000 mt/y), orthoxylene (6,000 mt/y), paraxylene (29,000 mt/y), polyester staple fiber (30,000 mt/y).

CHEMICALS & PLASTICS INDIA LTD.

Krishnagiri. Feed: molasses. Product: ethanol (12,000 mt/y).

Metturdam. Feed: chlorine, ethanol. Products: ethylene (18,700 mt/y), ethylene dichloride

(37,000 mt/y), polyvinyl chloride (21,300 mt/y), vinyl chloride (22,000 mt/y).

CHEMIDYE MANUFACTURING CO. LTD.

Tamil Nadu. Feed: phthalic anhydride. Products: solvents (5,000 mt/y), plasticizers (5,000 mt/y).

COROMANDEL FERTILIZERS LTD.

(International Minerals & Chemicals Corp., Chevron Chemical Corp., E.I.D. Parry (India) Ltd.)

Visakhapatnam, Andhra Pradesh. Feed: naphtha. Products: ammonia (114,240 mt/y), urea (125,600 mt/y).

FERTILIZER CORP. OF INDIA LTD.

Gorakhpur, Uttar Pradesh. Feed: naphtha. Products: ammonia (171,000 mt/y), urea (285,000 mt/y).

Ramagundam, Andhra Pradesh. Feed: coal. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

Sindri, Bihar. Feed: fuel oil. Products: ammonia (297,000 mt/y), urea (330,000 mt/y).

Taicher, Orissa. Feed: coal. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

FERTILIZERS AND CHEMICALS, TRAVANCORE LTD. (FACT).

Ambalamedu (near Cochin), Kerala. Feed: naphtha. Products: ammonia (219,000 mt/y).

Udyogamandal (near Cochin), Kerala. Feed: naphtha, benzene. Product: ammonia (51,000 mt/y), caprolactam (50,000 mt/y), urea (365,000 mt/y).

GARWARE NYLONS LTD.

Pimpri, Poona. Feed: caprolactam, dimethyl terephthalate, ethylene glycol. Products: nylon 6 (4,830 mt/y), polyamide (360 mt/y), polyester (1,576 mt/y).

GUJARAT NARMADA VALLEY FERTILIZERS CO. LTD.

Narmadanagar, Bharuch. Feed: fuel oil. Products: ammonia (1,350 mt/d), methanol (60 mt/d), urea (1,800 mt/d).

GUJARAT STATE FERTILIZERS CO. LTD.

Fertilizernagar (near Baroda). Feed: benzene, naphtha, natural gas. Products: ammonia (348,000 mt/y), caprolactam (20,000 mt/y), melamine (5,000 mt/y), nylons (4,000 mt/y), urea (367,200 mt/y).

HERDILLIA CHEMICALS LTD.

Thane, Bombay. Feed: benzene, orthoxylene, propylene, 2-ethyl hexanol. Products: acetone (12,000 mt/y), cumene (29,800 mt/y), phenol (20,000 mt/y), phthalic anhydride (8,600 mt/y), plasticizers (8,500 mt/y), solvents (3,600 mt/y), styrene (900 mt/y).

HINDUSTAN FERTILIZER CORP. LTD.

Barauni (Bihar). Feed: naphtha. Products: ammonia (600 mt/d), urea (1,000 mt/d).

Durgapur. Feed: naphtha. Products: ammonia (600 mt/d), urea (1,000 mt/d).

Namrup (Assam). Feed: natural gas. Products: ammonia (1,400 mt/d), urea (2,167 mt/d).

HINDUSTAN ORGANIC CHEMICALS LTD.

(Government of India enterprise).

Rasayani and Cochin. Products: acetic acid (1,330 mt/y), acetic anhydride (2,000 mt/y), acetone (24,640 mt/y), formaldehyde (15,000 mt/y), phenol (40,000 mt/y), propylene (7,000 mt/y).

IEL LTD.

Kanpur, Uttar Pradesh. Feed: naphtha. Products: ammonia (411,000 mt/y), urea (675,000 mt/y).

ILAC LTD.

(100% Ahmedabad Mfg. & Calico Printing Co. Ltd.)

Bombay. Feed: acetylene. Products: polyvinyl chloride (25,000 mt/y), vinyl chloride (6,500 mt/y).

INDIAN FARMERS FERTILIZER COOPERATIVE

LTD.-Aonia, Bareilly. Feed: natural gas. Products: ammonia (445,500 mt/y), urea (726,000 mt/y).

Kalol, Gujarat. Feed: natural gas. Products: ammonia (300,300 mt/y), urea (396,000 mt/y).

Phulpur, Uttar Pradesh. Feed: ammonia. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

INDIAN OIL CORP. LTD.

Gujarat, Baroda. Feed: reformate. Products: benzene (50,000 mt/y), toluene (20,000 mt/y).

INDIAN PETROCHEMICALS CORP. LTD.

Baroda, Gujarat. Feed: naphtha. Products: acrylonitrile (30,000 mt/y), alkylbenzene (43,500 mt/y), aromatics mix (10,000 mt/y), benzene (23,600 mt/y), butadiene (22,000 mt/y), carbon black feedstock (17,900 mt/y), dimethyl terephthalate (30,000 mt/y), ethylene (130,000 mt/y), ethylene dichloride (100,000 mt/y), ethylene glycol (13,900 mt/y), ethylene oxide (5,000 mt/y), normal paraffins (25,000 mt/y), xylene mix (2,900 mt/y), paraxylene (48,600 mt/y), polybutadiene rubber (20,000 mt/y), ld polyethylene (80,000 mt/y), polypropylene (30,000 mt/y), polypropylene (Copol) (25,000 mt/y), polyvinyl chloride (55,000 mt/y), propylene (81,300 mt/y), pyrolysis gasoline (63,900 mt/y), vinyl chloride (57,300 mt/y).

MADRAS FERTILIZERS LTD.

Manali. Feed: naphtha. Products: ammonia (247,500 mt/y), urea (292,000 mt/y).

MCDOWELL & CO. LTD. (Polymers Division)

Visakhapatnam. Feed: benzene, molasses. Products: ethylbenzene (13,500 mt/y), styrene (15,000 mt/y), polystyrene (14,500 mt/y).

MYSORE PETROCHEMICALS LTD.

Reichur, Karnataka. Feed: orthoxylene. Product: phthalic anhydride (10,230 mt/y).

NAGARJUNA FERTILIZERS AND CHEMICALS

LTD.-Kakinada. Feed: natural gas. Products: ammonia (900 mt/d), toluene (1,500 mt/d).

NATIONAL FERTILIZERS LTD.

Bhatinda, Punjab. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), urea (511,500 mt/y).

Naya Nangal, Punjab. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), methanol (16,500 mt/y), urea (330,000 mt/y).

Panipat, Haryana. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), urea (511,500 mt/y).

NATIONAL ORGANIC CHEMICAL INDUSTRIES LTD.

Thane. Feed: naphtha. Products: acetone (14,000 mt/y), benzene (17,000 mt/y), butadiene (7,200 mt/y), butanol (6,000 mt/y), ethylene (63,000 mt/y), ethylene dichloride (50,000 mt/y), ethylene glycol (11,000 mt/y), ethylene oxide (14,000 mt/y), isopropanol (21,000 mt/y), methyl isobutyl ketone (4,000 mt/y), oxoalcohols (10,000 mt/y), polyvinyl chloride (21,500 mt/y), propylene (37,000 mt/y), vinyl chloride (30,000 mt/y).

PHILLIPS CARBON BLACK LTD.

(owned by Phillips Petroleum, Duncan Bros. Co. Ltd., and public)

Durgapur, West Bengal. Feed: heavy oil. Product: carbon black (50,000 mt/y).

POLYCHEM LTD.

Baroda. Feed: acrylonitrile, butadiene, styrene. Product: ABS (5,000 mt/y).

Bombay. Feed: alcohol, benzene, ethylene. Products: ethylbenzene (20,000 mt/y), ethylene (2,000 mt/y), polystyrene (16,000 mt/y), styrene (17,500 mt/y), toluene (800 mt/y).

Nira (Maharashtra). Feed: acetic acid, alcohol, ethanol, molasses, oxygen. Products: acetaldehyde (7,300 mt/y), acetic acid (9,125 mt/y), vinyl acetate (11,000 mt/y), polyvinyl alcohol (2,200 mt/y).

POLYOLEFINS INDUSTRIES LTD. (PIL).

Thane, Maharashtra. Feed: ethylene. Product: hd polyethylene (50,000 mt/y).

RASHTRIYA CHEMICALS & FERTILIZERS LTD.

Chembur, Bombay. Feed: associated gas, naphtha. Products: ammonia (402,600 mt/y), methanol (36,000 mt/y), urea (429,000 mt/y).

Thal, Ailbag. Feed: associated gas. Products: ammonia (891,000 mt/y), urea (1,485,000 mt/y).

SHRI AMBUJA PETROCHEMICALS LTD.

Patancheru, Medak District. Feed: orthoxylene. Product: phthalic anhydride (12,000 mt/y).

SHRIRAM FERTILIZERS AND CHEMICALS

Shriram Nagar, Kota. Feed: naphtha, acetylene. Products: ammonia (200,000 mt/y), polyvinyl chloride (33,000 mt/y), urea (330,000 mt/y).

SOUTHERN PETROCHEMICAL INDUSTRIES

CORP. LTD.—Tuticorin, Tamil Nadu. Feed: naphtha. Products: ammonia (352,000 mt/y), urea (512,000 mt/y).

SYNTHETICS AND CHEMICALS LTD.

(with Kilachand Devchand & Co. and Firestone Tire & Rubber Co.)

Bareilly, Uttar Pradesh. Feed: alcohol, benzene, butadiene. Products: styrene (9,000 mt/y), SBR (33,000 mt/y).

THIRUMALAI CHEMICALS LTD.

Ranipet, Tamil Nadu. Feed: benzene, orthoxylene. Products: maleic anhydride (12,000 mt/y), phthalic anhydride (30,000 mt/y), unsaturated polyester (4,000 mt/y), plasticizers (6,000 mt/y).

UNITED CARBON INDIA LTD.

Thane. Feed: ethylene residues, phenol extracts, coal tar. Product: carbon black (40,000 mt/y).

ZUARI AGRO CHEMICALS LTD.

(Birla Gwalior Pvt. Ltd. and public interests)
Zuarinagar. Feed: naphtha. Products: ammonia (220,000 mt/y), urea (340,000 mt/y).

INDONESIA**PERTAMINA**

(state oil company)

Bunyu, East Kalimantan. Feed: natural gas. Product: methanol (330,000 mt/y).

Plaju, South Sumatra. Feed: paraxylene, propylene. Products: polypropylene (10,000 mt/y), terephthalic acid (150,000 mt/y).

PERUM PETROKIMIA GRESIK.

Gresik, Surabaya. Feed: fuel oil. Products: ammonia (3,600 mt/y), urea (45,000 mt/y).

P.T. GEMA POLYTAMA KIMIA.

Amyer, West Java. Product: polyols (27,500 mt/y).

P.T. PUPAK KALIMANTAN TIMUR.

Kaltim2, North Bontang. Product: ammonia (548,000 mt/y), urea (662,000 mt/y).

P.T. PUSRI

Palembang, South Sumatra. Feed: natural gas. Product: urea (480,000 mt/y).

P.T. PUPUK KUJANG

Cikampek, Java. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (570,000 mt/y).

IRELAND**IRISH FERTILIZER INDUSTRIES LTD.**

Dublin. Products: ammonia (435,000 mt/y), urea (330,000 mt/y), calcium ammonium nitrate.

ISRAEL**ELECTROCHEMICAL INDUSTRIES****(FRUTAROM) LTD.**

Near Aka. Feed: ethylene. Products: ethylene dichloride (160,000 mt/y), polyvinyl chloride (90,000 mt/y), vinyl chloride (100,000 mt/y).

FERTILIZERS & CHEMICALS LTD.

Haifa. Feed: LP-gas, naphtha. Products: ammonia (80,000 mt/y), urea (40,000 mt/y).

GADOT PETROCHEMICAL INDUSTRIES LTD.

Haifa Bay. Feed: reformate, pyrolysis gasoline, aromatic streams. Products: aromatics mix (150,000 mt/y), benzene (40,000 mt/y), normal paraffins (40,000 mt/y), orthoxylene (18,000 mt/y), paraxylene (22,000 mt/y), phthalic anhydride (20,000 mt/y), toluene (50,000 mt/y), xylene mix (60,000 mt/y).

ISRAEL PETROCHEMICAL ENTERPRISES

LTD.—Haifa. Feed: ethylene, styrene. Products: ld polyethylene (95,000 mt/y), polystyrene (16,000 mt/y).

ITALY**AGRIMONT SpA**

(Montedison Group)

Ferrara. Feed: natural gas. Products: ammonia (490,000 mt/y), urea (550,000 mt/y).

Porto Marghera. Feed: natural gas. Products: ammonia (175,000 mt/y), urea (180,000 mt/y).

Priolo. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (200,000 mt/y).

San Giuseppe di Cairo. Feed: natural gas. Products: ammonia (170,000 mt/y), urea (200,000 mt/y).

ALUSUISSE ITALIA SpA

Arezzo. Products: plasticizers (75,000 mt/y), polyester resins (50,000 mt/y), phthalic anhydride (25,000 mt/y).

Bergamo. Products: maleic anhydride (38,000 mt/y), phthalic anhydride (80,000 mt/y).

ASHLAND CHEMICAL ITALIANA SpA

Milan. Products: acrylics (7,000 mt/y), ABS (1,000 mt/y).

ATOCHM ITALIA

(Montedison Group)

Rho. Product: acrylics (65,000 mt/y).

AUSIND SpA

(Montedison Group)

Castellanza. Feed: natural gas. Products: formaldehyde (300,000 mt/y), melamine (26,000 mt/y), methanol (120,000 mt/y), urea (100,000 mt/y).

CABOT ITALIANA SpA

(subsidiary of Cabot Corp., Waltham, Mass.)

Ravenna. Feed: petroleum fractions, aromatic tar. Product: carbon black (75,000 mt/y).

CHIMICA DEL FRIULI

(Snia Viscosa group)

Torviscosa (Udine). Product: caprolactam (20,000 mt/y).

CHIMICA DEL TIRSO

(50% EniChem, 50% Montefibre)

Ottana (Sardinia). Feed: paraxylene. Product: terephthalic acid (80,000 mt/y).

CHIMICA DI COLLEFERRO SpA

(Snia Viscosa group)

Colleferro. Product: polyester (40,000 mt/y).

COLUMBIAN CARBON EUROPA SpA

(Snia Viscosa group)

Trecate. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (20,403 mt/y).

DISTILLERIE ITALIANE

(Alusuisse Italia SpA)

San Giovanni Vaidarno (Arezzo). Products: phthalic anhydride (25,000 mt/y), polyester (40,000 mt/y), plasticizers (75,000 mt/y).

DOW ITALIA SpA

Livorno. Products: ABS, polystyrene, SB-latex.

DUTRAL S.r.l.

(Enimont Group)

Ferrara. Product: EPR (60,000 mt/y).

ENICHEM

Geis. Feed: naphtha, natural gas. Products: acrylonitrile (90,000 mt/y), ammonia (220,000 mt/y), aromatics (150,000 mt/y), benzene (80,000 mt/y), butadiene (40,000 mt/y), ethylene (310,000 mt/y), ethylene dichloride (125,000 mt/y), ethylene glycol (46,000 mt/y), ethylene oxide (40,000 mt/y), ld polyethylene (90,000 mt/y), hd polyethylene (40,000 mt/y), polypropylene (50,000 mt/y), propylene (160,000 mt/y), toluene (90,000 mt/y), urea (200,000 mt/y), xylene mix (80,000 mt/y).

Manfredonia. Feed: natural gas. Products: ammonia (360,000 mt/y), urea (630,000 mt/y).

Pisticci. Feed: natural gas. Products: acrylic esters (7,000 mt/y), methanol (65,000 mt/y).

Ragusa. Feed: ethylene. Product: ld polyethylene (140,000 mt/y).

Ravenna. Feed: natural gas. Products: acetic acid (30,000 mt/y), acetylene (60,000 mt/y), ammonia (310,000 mt/y), butadiene (100,000 mt/y), isoprene (30,000 mt/y), polybutadiene (45,000 mt/y), polyisoprene (30,000 mt/y), polyvinyl acetate (25,000 mt/y), styrene (41,000 mt/y), urea (70,000 mt/y), vinyl acetate (30,000 mt/y), ABS (40,000 mt/y), SBR (150,000 mt/y), SBR latex (30,000 mt/y), nitrile (8,000 mt/y), solvents (100,000 mt/y).

FAR—Fabbrica Adesivi Resine

Filago, Bergamo District. Products: formaldehyde (100,000 mt/y), acrylics (20,000 mt/y), polyvinyl acetate (25,000 mt/y).

FTALITAL

(Alusuisse Italia SpA)

Scanzorosciate (Bergamo). Feed: benzene, butane, naphthalene, orthoxylene. Products: maleic anhydride (38,000 mt/y), phthalic anhydride (80,000 mt/y).

HIMONT ITALIA

Brindisi. Feed: propylene. Product: polypropylene (150,000 mt/y).

Ferrara. Feed: propylene. Product: polypropylene (120,000 mt/y).

Terni. Feed: propylene. Product: polypropylene (180,000).

ICAM

(100% EniChem)

Priolo. Feed: naphtha, gas oil. Products: ethylene (600,000 mt/y), propylene.

KUWAIT OIL

Naples. Feed: light naphtha, hp reformate. Products: benzene (150,000 mt/y), cyclohexane (55,000 mt/y), orthoxylene (55,000 mt/y), paraxylene (80,000 mt/y), xylene mix (35,000 mt/y).

MONTEDIPE

(Montedison Group)

Ferrara. Product: polyester (6,500 mt/y).

Mantova. Products: acetone (140,000 mt/y), ethylbenzene (350,000 mt/y), ethylene dichloride (200,000 mt/y), maleic anhydride (11,000 mt/y), phenol (230,000 mt/y), polystyrene (270,000 mt/y), styrene (350,000 mt/y).

Porto Marghera. Products: acetic acid (65,000 mt/y), acetylene (40,000 mt/y), caprolactam (100,000 mt/y), ethylene (350,000 mt/y), propylene (180,000 mt/y), vinyl acetate (55,000 mt/y).

Priolo. Products: acetaldehyde (140,000 mt/y), ethylene dichloride (190,000 mt/y), ethylene oxide (15,000 mt/y), propylene glycol (13,000 mt/y), propylene oxide (40,000 mt/y).

Villadossola. Products: acrylics (11,000 mt/y), polyvinyl alcohol (2,000 mt/y), polyvinyl acetate (64,000 mt/y), polyvinyl acetate-ethylene (25,000 mt/y).

SARAS CHIMICA

(60% EniChem, 20% Saras, 20% Montedison)

Sarroch (Sardinia). Feed: refinery feedstock. Products: cumene (200,000 mt/y), ethylbenzene (40,000 mt/y), n-paraffins (160,000 mt/y), orthoxylene (80,000 mt/y), paraxylene (80,000 mt/y).

SARPOM

Trecate (Novara). Feed: intermediate and heavy virgin naphtha. Products: aromatics mix (25,000 mt/y), xylene mix (12,000 mt/y).

SELM-Societa Energia Montedison (Montedison Group)

Priolo. Feed: naphtha, pyrolysis gasoline, propylene. Products: benzene (350,000 mt/y), cumene (270,000 mt/y), ethylbenzene (70,000 mt/y), orthoxylene (75,000 mt/y), paraxylene (130,000 mt/y), toluene (200,000 mt/y).

SOCIETA CHIMICA DAUNA

(50% EniChem, 50% Snia Viscosa)

Manfredonia, Foggia. Feed: toluene. Product: caprolactam (80,000 mt/y).

SOLVAY & CIE. SA

Ferrara. Feed: vinyl chloride monomer. Products: polyvinyl chloride.

Rosignano. Feed: ethylene. Product: hd polyethylene.

TECNOPOLIMERI SpA

(Snia Viscosa group)

Ceriano Laghetto (Milan). Feed: caprolactam, PA66. Product: polyamide (27,000 mt/y).

TERNI INDUSTRIE CHIMICHE SpA

Nera Montoro (Terni). Feed: natural gas. Products: ammonia (120,000 mt/y), urea (100,000 mt/y).

JAPAN

ASAHI CHEMICAL INDUSTRY CO. LTD.

Kawasaki. Products: acrylic esters (20,000 mt/y), acrylonitrile (89,760 mt/y), acrylics (26,950 mt/y), polystyrene (55,200 mt/y), styrene (65,000 mt/y), BR-SBR rubber (129,000 mt/y).

Mizushima. Products: acrylonitrile (128,700 mt/y), ammonia (264,000 mt/y), hd polyethylene (82,000 mt/y), ld polyethylene (96,000 mt/y), polystyrene (145,000 mt/y), styrene (330,000 mt/y), ABS (48,000 mt/y), resins (25,000 mt/y), SB latex (14,000 mt/y).

Nobeoka. Product: nylon 66 (15,000 mt/y).

ASAHI GLASS CO. LTD.

Chiba. Feed: chlorine, natural gas, propylene. Products: ammonia (46,000 mt/y), propylene glycol (14,000 mt/y), propylene oxide (26,000 mt/y).

Kashima. Feed: chlorine, propylene. Products: propylene glycol (26,000 mt/y), propylene oxide (60,000 mt/y).

ASIA OIL CO. LTD.

Yokohama. Feed: heavy reformate. Product: benzene (100,000 mt/y).

CHIBA BUTADIENE INDUSTRY CO. LTD.

Goi-minamikaigan, Chiba. Feed: C₄. Product: butadiene (75,000 mt/y).

CHIBA EDC CO. LTD.

Chiba. Feed: chlorine, ethylene. Product: ethylene dichloride (74,000 mt/y).

CHIBA VCM CO. LTD.

Chiba. Feed: ethylene, ethylene dichloride. Product: vinyl chloride (160,000 mt/y).

CHISSO CORP.

Minamata and Mizushima. Feed: ethylene, vinyl chloride monomer. Products: polyvinyl chloride (96,000 mt/y), butanol (25,000 mt/y), butyraldehyde (100,000 mt/y).

CHISSO PETROCHEMICAL CORP.

Goi. Feed: ethylene, propylene. Products: oxoalcohols (100,000 mt/y), hd polyethylene (58,000 mt/y), polypropylene (213,000 mt/y), polyvinyl chloride (64,000 mt/y), solvents (44,000 mt/y), plasticizers (80,000 mt/y).

COSMO MATSUYAMA OIL CO. LTD.

Ohkage. Feed: naphtha. Products: aromatics

(119,300 mt/y), benzene (7,500 mt/y), toluene (21,700 mt/y), xylene mix (30,660 mt/y).

DAICEL CHEMICAL INDUSTRIES LTD.

Abooshi. Feed: acetic acid, methanol. Products: acetic acid (225,000 mt/y), acetic anhydride (120,000 mt/y).

Fuji, Shizuoka. Feed: methanol. Product: formaldehyde (190,000 mt/y).

Ohtake, Hiroshima. Feed: acetaldehyde, naphtha, propylene. Products: acetic acid (36,000 mt/y), solvents (50,000 mt/y), plasticizers (10,000 mt/y).

DAINIPPON INK & CHEMICALS INC.

Amagasaki, Chiba, Mikawa, Yokkaichi. Products: acrylics (50,000 mt/y), alkyls (42,000 mt/y), butylenes (20,000 mt/y), formaldehyde (100,000 mt/y), polyamide (4,000 mt/y), polyester (70,000 mt/y), polystyrene (84,000 mt/y).

DENKI KAGAKU KOGYO KABUSHIKI KAISHA

Goi, Chiba Prefecture. Feed: acetic acid, benzene, ethylene, vinyl chloride. Products: ABS (55,000 mt/y), ethylbenzene (185,000 mt/y), polystyrene (113,500 mt/y), polyvinyl chloride (65,000 mt/y), styrene (160,000 mt/y).

Ohmi, Niigata Prefecture. Products: polyvinyl alcohol (28,800 mt/y), polyvinyl chloride (24,000 mt/y).

Shibukawa. Product: polyvinyl chloride (26,500 mt/y).

DU PONT-MITSUI POLYCHEMICALS CO. LTD.

(50% E.I. du Pont de Nemours & Co., 50% Mitsui Petrochemical Ind. Ltd.)

Chiba. Feed: ethylene. Product: ld polyethylene (100,000 mt/y).

Ohtake. Feed: ethylene. Product: ld polyethylene (42,000 mt/y).

FUJI OIL CO. LTD.

Sodegaura, Chiba. Feed: naphtha. Product: n-paraffins (8,100 mt/y).

GENERAL PETROCHEMICAL INDUSTRIES

LTD.-Osaka. Feed: FCC, reformate. Products: benzene (30,000 mt/y), n-butylene (50,000 mt/y), propylene (65,000 mt/y), TBA (55,000 mt/y), toluene (120,000 mt/y), xylene mix (150,000 mt/y).

IDEMITSU PETROCHEMICAL CO. LTD.

Chiba. Feed: naphtha. Products: benzene (150,000 mt/y), paraxylene (130,000 mt/y), hd polyethylene (82,000 mt/y), polypropylene (80,000 mt/y), polystyrene (30,000 mt/y), styrene (160,000 mt/y).

Tokuyama. Feed: naphtha. Products: benzene (180,000 mt/y), cyclohexane (90,000 mt/y), ethylene (380,000 mt/y), polystyrene (60,000 mt/y), propylene (220,000 mt/y), styrene (91,000 mt/y)—joint ownership with Nippon Zeon), toluene (74,000 mt/y), xylene mix (102,000 mt/y).

JAPAN A.G. INTERNATIONAL CHEMICAL CO. LTD.-(subsidiary of Mitsubishi Gas Chemical Co. Ltd.)

Mizushima. Feed: metaxylene. Product: isophthalic acid (35,000 mt/y).

JAPAN ALDEHYDE CO. LTD.

Chiba. Feed: ethylene. Product: acetaldehyde (69,000 mt/y).

JAPAN BUTANOL CO. LTD.

Yokkaichi. Product: butanol (30,000 mt/y).

JAPAN BUTYL CO. LTD.

Kashima. Product: butyl rubber (25,000 mt/y). **Kawasaki.** Feed: isobutylene, isoprene. Product: butyl rubber (75,000 mt/y).

JAPAN ETHANOL CO. LTD.

Yokkaichi. Feed: ethylene. Product: ethanol (40,000 mt/y).

JAPAN LACTAM CO. LTD.

Niihama. Feed: cyclohexene, hydroxylamine. Product: caprolactam (72,000 mt/y).

JAPAN PHENOL CO. LTD.

Kashima. Feed: cumene. Products: acetone (80,000 mt/y), phenol (130,000 mt/y).

JAPAN PHTHALIC CO. LTD.

(subsidiary of Mitsubishi Gas Chemical Co. Ltd.)

Mizushima. Feed: orthoxylene. Product: phthalic anhydride (75,000 mt/y).

JAPAN SYNTHETIC ALCOHOL CO. LTD.

Kawasaki. Feed: ethylene. Product: ethanol (40,000 mt/y).

JAPAN SYNTHETIC RUBBER CO. LTD.

Chiba. Feed: butadiene. Products: polybutadiene rubber (65,000 mt/y).

Kashima. Feed: C₄-C₅ streams. Products: polyisoprene (30,000 mt/y).

Yokkaichi. Feed: acrylonitrile, C₄ stream, ethylene, propylene, styrene. Products: ABS (142,000 mt/y), SBR (255,000 mt/y), ethylene-propylene rubber (45,000 mt/y).

KANEGAFUCHI KAGAKU KK

Kashima. Products: polystyrene (22,800 mt/y), polyvinyl chloride (62,000 mt/y).

Osaka. Product: polyvinyl chloride (22,000 mt/y).

Takasago. Products: polystyrene (28,800 mt/y), polyvinyl chloride (88,000 mt/y), styrene copolymer (41,600 mt/y), vinyl chloride (320,000 mt/y).

KASHIMA VINYL CHLORIDE MONOMER CO. LTD.-Kashima.

Feed: ethylene. Product: vinyl chloride (270,000 mt/y).

KAWASAKI KASEI CHEMICALS LTD.

Kawasaki. Feed: crude naphthalene, orthoxylene, oxoalcohols, phthalic anhydride. Products: naphthalene (12,000 mt/y), phthalic anhydride (72,000 mt/y), plasticizers (57,000 mt/y).

KURARAY CO. LTD.

Kashima. Product: polyisoprene (2,500 mt/y). **Okayama.** Feed: ethylene. Product: polyvinyl alcohol (225 mt/d).

Nakajo. Feed: ethylene. Product: polyvinyl alcohol (120 mt/d).

KURARAY YUKA CO. LTD.

Yokkaichi City. Feed: paraxylene. Product: terephthalic acid (53,000 mt/y).

KYODO SAKUSAN CO. LTD.

(subsidiary of Daicel Chemical Industries Ltd.)

Abooshi, Himeji, Hyogo. Feed: methanol. Product: acetic acid (225,000 mt/y).

KYOWA YUKA CO. LTD.

Yokkaichi. Feed: ethylene, propylene. Products: acetaldehyde (125,000 mt/y), acetone (36,000 mt/y), butanol (60,000 mt/y), butyraldehyde (180,000 mt/y), oxoalcohols (100,000 mt/y), plasticizers (100,000 mt/y).

MITSUBISHI KASEI CORP.

Kurosaki. Feed: coal, LPG, naphtha. Products: ammonia (264,000 mt/y), caprolactam (100,000 mt/y), carbon black (36,000 mt/y), dimethyl terephthalate (80,000 mt/y), nylons (15,000 mt/y), terephthalic acid (270,000 mt/y), urea (264,000 mt/y).

Mizushima. Feed: naphtha, LPG. Products: acetaldehyde (120,000 mt/y), acetone (55,000 mt/y), acrylonitrile (112,000 mt/y), alphaolefins (50,000 mt/y), benzene (200,000 mt/y), butanol (25,000 mt/y), cyclohexane (100,000 mt/y), maleic anhydride (21,000 mt/y), oxoalcohols (226,000 mt/y), orthoxylene (27,000 mt/y), paraxylene (60,000 mt/y), ld polyethylene (84,000 mt/y), hd polyethylene (85,000 mt/y), polypropylene (41,000 mt/y), propylene (239,000 mt/y), toluene (60,000 mt/y), vinyl chloride (250,000 mt/y), xylene mix (30,000 mt/y).

Yokkaichi. Feed: butadiene, styrene. Products: polystyrene (16,000 mt/y).

MITSUBISHI GAS CHEMICAL CO. INC.

Mizushima. Feed: mixed xylene. Products: ethylbenzene (60,000 mt/y), metaxylene (50,000 mt/y).

y), orthoxylene (70,000 mt/y), paraxylene (120,000 mt/y), xylene mix (300,000 mt/y), plasticizers (65,000 mt/y).

Nilgata. Feed: natural gas. Products: ammonia (211,200 mt/y), formaldehyde (220,000 mt/y), methanol (264,000 mt/y), urea (198,000 mt/y).

MITSUBISHI MONSANTO CHEMICAL CO.

Yokkaichi. Feed: acrylonitrile, styrene, SBR. Products: acrylonitrile-styrene (32,000 mt/y), ABS (60,000 mt/y), polystyrene (160,000 mt/y), polyvinyl butyral (6,000 mt/y).

MITSUBISHI PETROCHEMICAL CO. LTD.

Kashima. Feed: LPG, naphtha. Products: benzene (221,850 mt/y), cumene (140,000 mt/y), ethylene (387,400 mt/y), ethylene glycol (68,000 mt/y), ethylene oxide (70,000 mt/y), melamine (30,000 mt/y), ld polyethylene (158,900 mt/y), polypropylene (168,000 mt/y), styrene monomer (192,000 mt/y), xylene mix (53,500 mt/y).

Yokkaichi. Feed: LPG, naphtha. Products: acrylic acid-esters (54,000 mt/y), alkylbenzene (65,000 mt/y), benzene (221,850 mt/y), ethylene (254,200 mt/y), ethylene glycol (86,000 mt/y), ethylene oxide (85,000 mt/y), oxoalcohols (30,000 mt/y), ld polyethylene (57,100 mt/y), polypropylene (74,000 mt/y), styrene monomer (261,200 mt/y), toluene (24,000 mt/y), xylene (13,000 mt/y).

MITSUBISHI YUKA BADISCHE CO. LTD.

(joint venture of BASF and Mitsubishi Petrochemical Co. Ltd.)

Yokkaichi. Feed: styrene. Product: expandable polystyrene (49,000 mt/y).

MITSUI PETROCHEMICAL INDUSTRIES LTD.

Chiba, Iwakuni. Feed: naphtha, LPG, heavy natural gas liquid. Products: acetaldehyde (3,600 mt/y), acetone (144,000 mt/y), benzene (15,500 mt/y), ethylene (601,600 mt/y), ethylene oxide (113,000 mt/y), phenol (210,000 mt/y), terephthalic acid (550,000 mt/y), polypropylene (172,700 mt/y), toluene (100,000 mt/y), xylene mix (83,000 mt/y), polyethylene (273,800 mt/y).

MITSUI TOATSU CHEMICALS INC.

Shimonoseki. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (30,000 mt/y).

Yokoshiba. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (45,000 mt/y).

MIZUSHIMA AROMA CO. LTD.

(subsidiary of Mitsubishi Gas Chemical Co. Ltd.)

Mizushima. Feed: paraxylene. Product: terephthalic acid (150,000 mt/y).

MIZUSHIMA ETHYLENE KK

(50% Mitsubishi Chemical Industries, 50% Sanyo Petrochemicals).

Mizushima. Feed: LPG, naphtha. Products: ethylene (440,000 mt/y), propylene (239,000 mt/y).

NIHON ALKYLATE CO. LTD.

(Sumitomo Chemical Co. and Kao Soap Co.)

Niihama. Feed: benzene. Product: alkylbenzene (30,000 mt/y).

NIHON OXIRANE CO. LTD.

(ARCO, Sumitomo Chemical, Showa Denko).

Chiba. Feed: ethylbenzene, propylene. Products: propylene oxide (153,000 mt/y), styrene (366,500 mt/y).

NIHON POLYSTYRENE CO. LTD.

Chiba. Feed: styrene. Product: polystyrene (70,000 mt/y).

Kawasaki. Feed: styrene. Product: polystyrene (88,000 mt/y).

NIPPON CARBIDE INDUSTRIES CI

Toyama. Feed: acrylic acid-esters, formaldehyde, melamine, styrene, vinyl acetate-chloride. Products: acrylics, polyvinyl chloride.

NIPPON KASEI CHEMICAL CO. LTD.

Onahama, Fukushima. Feed: creosote oil, methanol. Products: carbon black (30,000 mt/y), formaldehyde (96,000 mt/y).

NIPPON MINING CO. LTD.

Mizushima. Feed: reformat. Products: n-paraffins (80,000 mt/y), propylene (80,000 mt/y), xylene mix (70,000 mt/y).

Nagoya. Feed: reformat. Products: benzene (112,000 mt/y), cyclohexane (80,000 mt/y), paraxylene (100,000 mt/y), propylene (20,000 mt/y), toluene (120,000 mt/y), xylene mix (123,000 mt/y).

NIPPON OIL AND FATS CO.

Osaka. Feed: C₄ butane, LPG. Products: maleic anhydride (13,000 mt/y), polybutylene (7,300 mt/y), solvents (1,500 mt/y).

NIPPON PETROCHEMICALS CO. LTD.

Kawasaki and Ukiyama. Feed: LPG, naphtha. Products: benzene (72,000 mt/y), butadiene (60,000 mt/y), isopropanol (60,000 mt/y), n-paraffins (75,000 mt/y), ld polyethylene (95,000 mt/y), toluene (42,000 mt/y), xylene (34,000 mt/y).

NIPPON PETROLEUM DETERGENT CO. LTD.

(50% Nippon Petrochemicals Co., 50% Chevron Chemical Co.)

Kawasaki. Feed: benzene, n-paraffin, propylene. Product: alkylbenzene (90,000 mt/y).

NIPPON POLYURETHANE INDUSTRIAL CO.

LTD.-Shin-Nanyo, Yamaguchi. Product: polyester (7,200 mt/y).

NIPPON SHOKUBAI KAGAKU KOGYO CO.

LTD.-Himeji. Feed: benzene, naphthalene, orthoxylene, propylene. Products: acrylic acid esters (164,000 mt/y), ethylene glycol (185,000 mt/y), ethylene oxide (210,000 mt/y), maleic anhydride (26,000 mt/y), phthalic anhydride (40,000 mt/y).

Kawasaki. Feed: ethylene. Products: ethylene glycol (185,000 mt/y), ethylene oxide (210,000 mt/y).

Suita. Feed: ethylene glycols, phthalic anhydride, styrene. Product: alkyls, polyester (48,000 mt/y).

NIPPON ZEON CO. LTD.

Kawasaki. Feed: acrylonitrile, butadiene, styrene. Products: NBR (30,000 mt/y), SBR (30,000 mt/y).

Mizushima. Feed: vinyl chloride. Product: polyvinyl chloride (130,000 mt/y).

Takaoka. Feed: vinyl chloride. Product: polyvinyl chloride (80,000 mt/y).

Tokuyama. Feed: C₄ stream. Products: butadiene (140,000 mt/y), polybutylene (48,000 mt/y), EBR (10,000 mt/y), SBR-NBR-HS (190,000 mt/y).

NISSAN CHEMICAL INDUSTRIES LTD.

Toyama. Feed: LPG, naphtha. Products: ammonia (113,000 mt/y), melamine (42,000 mt/y), urea (127,000 mt/y).

NISSAN MARUZEN POLYETHYLENE CO. LTD.

Goi, Chiba. Feed: ethylene. Product: hd polyethylene (70,000 mt/y).

NISSAN NALKEN CORP.

Chiba, Pref. Feed: benzene, n-paraffin. Product: alkylbenzene (40,000 mt/y).

NISSAN PETROCHEMICAL LTD.

Goi, Chiba. Feed: ethylene, olefins, propylene. Products: oxoalcohols (80,000 mt/y), polyvinyl chloride (55,000 mt/y), vinyl chloride (60,000 mt/y).

NISSO MARUZEN CHEMICAL CO. LTD.

Goi, Ichihara. Feed: ethylene, propylene oxide. Products: ethylene glycol (70,000 mt/y), ethylene oxide (70,000 mt/y), propylene glycol (22,000 mt/y).

NISSO PETROCHEMICAL INDUSTRIES CO.

LTD.-Yokkaichi. Feed: ethylene. Products: ethylene glycol (60,000 mt/y), ethylene oxide (60,000 mt/y).

OKAYAMA BUTADIENE CO. LTD.

(Joint venture of Nippon Zeon Co. Ltd. and Asahi Chemical Industry Co. Ltd.)

Mizushima. Feed: C₄ stream. Product: butadiene (140,000 mt/y).

OSAKA GAS CO. LTD.

Osaka. Feed: coke oven gas oil. Products: benzene (56,000 mt/y), naphthalene (11,000 mt/y), toluene (5,000 mt/y).

OSAKA PETROCHEMICAL INDUSTRIES LTD.

Takaishi City, Osaka. Feed: naphtha. Products: aromatics (260,000 mt/y), ethylene (332,000 mt/y), propylene (249,000 mt/y).

SANYO ETHYLENE CO. LTD.

Mizushima. Feed: naphtha. Products: ethylene (390,000 mt/y), propylene (254,000 mt/y).

SANYO MONOMER CO. LTD.

(joint venture of Nippon Zeon Co. Ltd., Asahi Chemical Co., Chisso Corp.)

Mizushima. Feed: ethylene, chlorine. Products: vinyl chloride (175,000 mt/y).

SEITETSU KAGAKU CO. LTD.

Betu. Products: formaldehyde (32,400 mt/y).

Himeji. Products: formaldehyde (107,000 mt/y), methanol (165,000 mt/y).

SENBOKU POLYMER CO. LTD.

(50% Mitsui Toatsu, 35% Nippon Petrochemicals, 15% Asahi Chemicals).

Osaka. Product: polypropylene (80,000 mt/y).

SHIN-DAIKYOWA PETROCHEMICAL CO. LTD.

(Daikyo Oil Co. Ltd., Tosoh Corp., Kyowa Hakko Kogyo Co. Ltd., Dainippon Ink and Chemicals Inc., Industrial Bank of Japan).

Yokkaichi. Feed: naphtha. Products: aromatics (124,000 mt/y), benzene (90,000 mt/y), butadiene (44,000 mt/y), cumene (140,000 mt/y), ethylene (300,000 mt/y), ethylbenzene (130,000 mt/y), propylene (160,000 mt/y), styrene (91,000 mt/y), toluene (60,000 mt/y), xylene mix (50,000 mt/y).

SHIN-ETSU CHEMICAL CO. LTD.

Kashima. Feed: vinyl chloride. Product: polyvinyl chloride (198,000 mt/y).

Shin-Nanyo. Feed: vinyl chloride. Product: polyvinyl chloride (42,000 mt/y).

SHIN-ETSU VINYL ACETATES CO. LTD.

Sakai. Feed: acetic acid, ethylene. Product: vinyl acetate (80,000 mt/y).

SHOWA ACETYL CHEMICAL CO. LTD.

Osaka. Feed: ethylene. Products: acetaldehyde (100,000 mt/y), acetic acid (130,000 mt/y), vinyl acetate (80,000 mt/y).

SHOWA DENKO KK

Kawasaki. Feed: LPG. Products: acrylonitrile (51,200 mt/y), ammonia (197,200 mt/y), propylene oxide (35,000 mt/y), polystyrene (57,600 mt/y).

Osaka. Feed: naphtha. Products: acetaldehyde (130,000 mt/y), acetic acid (100,000 mt/y), ethylene (584,000 mt/y), hd polyethylene (152,000 mt/y), ld polyethylene (120,000 mt/y), polypropylene (138,000 mt/y), propylene (351,000 mt/y), vinyl acetate (80,000 mt/y).

SHUNAN CHEMICAL CO. LTD.

Tokuyama City. Products: ethylene dichloride (130,000 mt/y), propylene oxide (40,000 mt/y).

SUMITOMO CHEMICAL CO. LTD.

Chiba. Feed: butane, LPG, naphtha. Products: benzene (100,000 mt/y), ethylene (357,500 mt/y), polyethylene (182,800 mt/y), polyisoprene (170,000), propylene (144,000 mt/y), polyvinyl chloride (49,800 mt/y), propylene (255,100 mt/y), toluene (60,000 mt/y), xylene (40,000 mt/y), SBR (50,200 mt/y), ethylene-propylene rubber (35,000 mt/y).

Niihama. Feed: butane, naphtha. Products: acrylic acid-esters (40,000 mt/y), acrylonitrile (52,000 mt/y), polyvinyl chloride (19,300 mt/y).

SUN ARROW CHEMICAL CO. LTD.

(Tokuyama Soda Co. Ltd.)

Tokuyama. Feed: ethylene dichloride. Products: polyvinyl chloride (85,000 mt/y), vinyl chloride (180,000 mt/y).**TAKEDA CHEMICAL INDUSTRIES LTD.****Kashima.** Feed: benzene. Product: maleic anhydride (16,500 mt/y).**Shimizu.** Feed: butadiene, styrene maleic anhydride, propylene glycol. Products: polyester (27,500 mt/y), SBR (20,000 mt/y).**TEIJIN HERCULES CHEMICAL CO. LTD.****Ehime.** Feed: paraxylene. Product: dimethyl terephthalate (140,000 mt/y).**Matsuyama.** Feed: paraxylene. Product: dimethyl terephthalate (60,000 mt/y).**Tokuyama.** Feed: paraxylene. Product: dimethyl terephthalate (75,000 mt/y).**TEIJIN PETROCHEMICAL INDUSTRIES LTD.****Ehime.** Feed: mixed xylenes. Products: orthoxylene (30,000 mt/y), paraxylene (170,000 mt/y).**Tokuyama.** Feed: mixed xylene. Products: ethylbenzene (20,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (35,000 mt/y).**TOBU BUTADIENE CO. LTD.**

(50% Japan Synthetic Rubber, 50% Sumitomo Chemical)

Chiba. C₄ stream. Product: butadiene (80,000 mt/y).**TOHO RIKI KOGYO KK****Minato, Nagoya.** Feed: methanol, orthoxylene. Products: formaldehyde (80,000 mt/y), phthalic anhydride (30,000 mt/y), plasticizers (50,000 mt/y).**TOKUYAMA PETROCHEMICAL CO. LTD.****Shin-Nanyo.** Feed: ethylene. Products: acetaldehyde (100,000 mt/y), acetic acid (60,000 mt/y).**TOKUYAMA SODA CO. LTD.****Tokuyama.** Feed: propylene. Products: isopropanol (39,600 mt/y), polypropylene (108,000 mt/y), propylene oxide (54,000 mt/y).**TOKUYAMA STYRENE MONOMER CO. LTD.**

(jointly owned by Idemitsu Petrochemical Co. Ltd., and Nippon Zeon Co. Ltd.)

Tokuyama. Feed: benzene, ethylene. Product: styrene (91,000 mt/y).**TOMAKOMAI SODA CO. LTD.**

(Nippon Zeon, Hokkaido Soda, Maruzen Petrochemical, Nippon Light Metal, Nissio Iwai, Asahi Denka)

Tomakomai. Feed: ethylene. Product: ethylene dichloride (120,000 mt/y).**TONEN PETROCHEMICAL CO. LTD.****Kawasaki.** Feed: naphtha. Products: butadiene (100,000 mt/y), butanol (8,000 mt/y), butyraldehyde (50,000 mt/y), ethylene (463,000 mt/y), oxoalcohols (40,000 mt/y), hd polyethylene (80,000 mt/y), propylene (470,000 mt/y), polypropylene (180,000 mt/y), aromatics (210,000 mt/y), pyrolysis gasoline (170,000 mt/y), fuel oils (38,000 mt/y).**Wakayama.** Feed: naphtha. Products: benzene (55,000 mt/y), orthoxylene (65,000 mt/y), paraxylene (190,000 mt/y), toluene (110,000 mt/y).**TORAY INDUSTRIES INC.****Chiba.** Feed: acrylonitrile, butadiene, styrene. Product: ABS (55,000 mt/y).**Kawasaki.** Feed: benzene, toluene, xylene mix. Products: benzene (85,000 mt/y), cyclohexane (150,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (200,000 mt/y), xylene mix (39,000 mt/y).**Nagoya.** Feed: cyclohexane, paraxylene. Products: caprolactam (130,000 mt/y), nylon (26,400 mt/y), terephthalic acid (100,000 mt/y).**TOSOH CORP.****Shin-Nanyo, Yamagata.** Products: ld polyethylene (59,000 mt/y), vinyl chloride (255,000 mt/y), TBA (3,000 mt/y), ethylene dichloride (540,000 mt/y).

y), isoprene (2,000 mt/y), polyvinyl chloride (25,000 mt/y).

Yokkaichi, Mie. Products: ethylene dichloride (153,000 mt/y), vinyl chloride (220,000 mt/y), ld polyethylene (96,000 mt/y), hd polyethylene (75,000 mt/y), polyvinyl chloride (207,000 mt/y).**TOYO CONTINENTAL CARBON LTD.**

(subsidiary of Witco Corp.)

Shimonoseki. Feed: heavy aromatic oils. Product: carbon black (15,000 mt/y).**Yokoshiba.** Feed: heavy aromatic oils. Product: carbon black (45,000 mt/y).**UBE INDUSTRIES LTD.****Ichihara, Chiba.** Feed: butadiene, ethylene. Products: polybutadiene (60,000 mt/y), ld polyethylene (147,000 mt/y).**Sakai, Osaka.** Feed: benzene, LPG, LNG, naphtha, propylene. Products: ammonia (234,600 mt/y), caprolactam (90,000 mt/y), cyclohexane (100,000 mt/y), polypropylene (105,000 mt/y), urea (95,200 mt/y).**Ube, Yamaguchi.** Feed: benzene. Products: caprolactam (90,000 mt/y), cyclohexane (58,000 mt/y), nylon 6 (24,600 mt/y), nylon 66 (2,400 mt/y), nylon 12 (2,400 mt/y).**UKISHIMA AROMATIC CHEMICALS CO. LTD.**

(100% Nippon Petrochemicals Co. Ltd.)

Ukishima. Feed: benzene, C₈s, reformate. Products: cyclohexane (150,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (200,000 mt/y).**UKISHIMA PETROCHEMICALS CO. LTD.**

(50% Nippon Petrochemicals Co. Ltd., 50% Mitsui Petrochemical Industries)

Ukishima. Feed: LPG, naphtha. Products: ethylene (312,000 mt/y), propylene (172,000 mt/y).**UNITIKA CHEMICAL CO.****Sakai.** Feed: vinyl chloride. Product: polyvinyl alcohol (24,000 mt/y).**YUKA MELAMINE CO. LTD.****Kashima.** Feed: urea. Product: melamine (30,000 mt/y).**ZEON ISOPRENE CO. LTD.**

(Subsidiary of Nippon Zeon)

Mizushima. Feed: C₅ stream, isoprene. Products: isoprene (45,000 mt/y), polyisoprene (37,000 mt/y), C₅ resin.**JORDAN****INTERMEDIATES PETROCHEMICALS INDUSTRIES CO. LTD.****Zarqa.** Feed: glycols, maleic-phthalic anhydrides, oxoalcohols, polyvinyl chloride, styrene. Products: polyesters (8,000 mt/y), plasticizers (4,000 mt/y).**KOREA****DAELIM INDUSTRIAL CO. LTD.****Yeo-Chon, Chun-Nam.** Feed: naphtha. Products: aromatics (148,000 mt/y), benzene (74,000 mt/y), ethylene (350,000 mt/y), propylene (187,000 mt/y), styrene (100,000 mt/y), toluene (44,000 mt/y), xylene mix (30,000 mt/y).**DAINONG PETROCHEMICAL INDUSTRY CO. LTD.**

-joint venture Dainong Co. Ltd., Mitsui Toatsu Chemicals Inc., Toyo Menka Kaisha Ltd.)

Ulsan. Feed: benzene. Product: maleic anhydride (12,000 mt/y).**HAN YANG CHEMICAL CORP.****Yeo-chun, Jinhae, Ulsan.** Feed: ethylene. Products: plasticizers (46,000 mt/y), polyethylene (450,000 mt/y), polyvinyl chloride (260,000 mt/y), vinyl chloride (210,000 mt/y).**HANKOOK CAPROLACTAM CORP.****Ulsan.** Feed: cyclohexane. Product: caprolactam (80,000 mt/y).**HANNAM CHEMICAL CORP.****Ulsan.** Feed: acrylonitrile, butadiene, propylene

oxide, styrene. Product: ABS (40,000 mt/y), polystyrene (180,000 mt/y), propylene glycol (20,000 mt/y), SAN (20,000 mt/y).

HONAM OIL REFINERY CO. LTD.**Yosu.** Feed: crude oil. Products: aromatics mix (460,000 mt/y), benzene (100,000 mt/y), toluene (60,000 mt/y), paraxylene (200,000 mt/y), xylene mix (100,000 mt/y), polypropylene (165,000 mt/y).**ISU CHEMICAL CO. LTD.****Ulsan.** Feed: benzene, n-paraffin, n-olefin, propylene tet. Product: alkylbenzene (140,000 mt/y), normal paraffins (132,000 mt/y).**KOHAP CHEMICAL CORP.****Ulsan.** Feed: virgin xylene. Products: benzene (30,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (160,000 mt/y).**KOREA FERTILIZER CO. LTD.****Ulsan.** Feed: naphtha. Products: ammonia (195,000 mt/y), melamine (18,000 mt/y), urea (330,000 mt/y).**KOREA KUMHO PETROCHEMICAL CO. LTD.****Ulsan and Yeochun.** Feed: C₄, butadiene, styrene. Products: butadiene (70,000 mt/y), polybutadiene (35,000 mt/y), SBR (130,000 mt/y).**KOREA PETROCHEMICAL INDUSTRIES CO. LTD.****Ulsan.** Feed: ethylene, propylene. Products: hd polyethylene (70,000 mt/y), polypropylene (120,000 mt/y).**KOREA POLYOL CO. LTD.****Ulsan.** Feed: ethylene oxide, propylene oxide. Products: polyester polyol (50,000 mt/y), ethoxylates (5,000 mt/y), polyethylene glycol (5,000 mt/y).**KUMHO SHELL CHEMICAL CO.**

(Shell 50%, KKPC 50%)

Yeochon. Products: acetone (15,000 mt/y), cumene (40,000 mt/y), epoxy resins, DPP, phenol (25,000 mt/y).**LUCKY ADVANCED MATERIAL INC.**

(Licensee of Witco Corp.—Concarb Div.)

Bupyeong. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (30,000 mt/y).**Yosu.** Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (105,000 mt/y).**LUCKY LTD.****Na-Ju and Yeochun.** Products: acrylic acid-esters (77,000 mt/y), oxoalcohols (99,000 mt/y).**NAMHAE CHEMICAL CORP.****Yosu City, Chunnam.** Feed: naphtha. Products: ammonia (627,000 mt/y), urea (690,000 mt/y).**SAMKYUNG CHEMICAL CO. LTD.****Ulsan.** Feed: butanol, orthoxylene, phthalic anhydride, 2-ethyl hexanol. Product: maleic anhydride (3,000 mt/y), phthalic anhydride (70,000 mt/y), plasticizers (70,000 mt/y).**TONG SUH PETROCHEMICAL CORP. LTD.****Ulsan.** Feed: ammonia, propylene. Product: acrylonitrile (90,000 mt/y).**YONG-NAM CHEMICAL CO. LTD.****Ulsan.** Feed: naphtha. Product: ammonia (310 mt/d), urea (375 mt/d).**YUKONG ARCO CHEMICAL LTD.****Ulsan.** Products: propylene oxide (110,000 mt/y), styrene monomer (247,500 mt/y), propylene glycols (27,500 mt/y), polyols (20,000 mt/y).**YUKONG LTD.****Ulsan.** Feed: naphtha, LPG. Products: acetylene (4,000 mt/y), aromatics (210,000 mt/y), benzene (247,000 mt/y), butadiene (97,000 mt/y).

butylenes (30,000 mt/y), cyclohexane (136,000 mt/y), ethylene (555,000 mt/y), fuel oils (41,000 mt/y), propylene (293,000 mt/y), pyrolysis gasoline (408,000 mt/y), toluene (310,000 mt/y), xylene mix (344,000 mt/y), paraxylene (200,000 mt/y), orthoxylene (50,000 mt/y).

KUWAIT

PETROCHEMICAL INDUSTRIES CO.

Shuaiba. Feed: natural gas. Products: ammonia (3,000 mt/d), urea (2,400 mt/d).

LIBYA

Ras Lanuf. Product: ethylene (350,000 mt/y).

MADAGASCAR

N-REN CORP.

Tamatave. Feed: naphtha. Product: ammonia (175 mt/d).

ZE-REN

Tamatave. Product: urea (90,000 mt/y).

MALAYSIA

BORDEN CHEMICAL

Prai. Feed: methanol, phenol, urea. Product: formaldehyde (20,000 mt/y).

MALAYSIAN CARBON SDN. BHD.

(Subsidiary of Cabot Corp.)

Port Dickson. Feed: heavy aromatic oil. Product: carbon black.

MEXICO

CELANESE MEXICANA SA

Cangrejera. Products: acetic acid (119,000 mt/y), acetic anhydride (45,000 mt/y), acetone (60,000 mt/y), amines (9,500 mt/y), butanol (16,000 mt/y), butyraldehyde (90,000 mt/y), DMF (7,500 mt/y), vinyl acetate (31,000 mt/y), 2 ethyl hexanol (70,000 mt/y).

Celaya. Products: acetic acid (63,000 mt/y), acetic anhydride (45,000 mt/y), acetone (14,000 mt/y), butanol-n (38,000 mt/y), 2-ethyl hexanol (70,000 mt/y), MEK & esters (30,000 mt/y), mesityl oxide (22,000 mt/y), vinyl acetate (30,000 mt/y).

Cosolecaque. Product: acrylic acid-esters (30,000 mt/y).

Lerma. Products: phthalic anhydride (23,500 mt/y), plasticizers (22,500 mt/y).

Ocotlan. Products: polyamide (16,860 mt/y), polyester (14,500 mt/y).

Queretaro. Products: polyamide (7,000 mt/y), polyester (94,000 mt/y).

Toluca. Products: polyamide (12,000 mt/y), polyester (23,600 mt/y).

Zacapu. Product: polypropylene (4,700 mt/y).

DERIVADOS MALEICOS SA DE CV

Puebla. Feed: benzene. Product: maleic anhydride (7,000 mt/y).

FENOQUIMIA SA

(75% Industrias Resistol, 25% Promociones Industriales Banamex)

Cosolecaque, Ver. Feed: cumene, cyanhydric acid, methanol. Products: acetone (23,000 mt/y), acrylics (16,500 mt/y), phenol (38,000 mt/y).

FERTILIZANTES MEXICANOS SA

Camargo. Feed: ammonia, CO₂. Product: urea (75,000 mt/y).

Coatzacoalcos (Pajaritos). Feed: ammonia, carbon dioxide. Product: urea (990,000 mt/y).

Minatitlan. Feed: ammonia, carbon dioxide. Product: urea (302,000 mt/y).

Salamanca. Feed: ammonia, carbon dioxide. Product: urea (386,000 mt/y).

GLICOLES MEXICANOS SA DE CV

Apizaco, Tlaxcala. Feed: ethylene oxide. Product: ethylene glycol (100,000 mt/y).

HULES MEXICANOS SA

(owned by Pemex and Polysar Ltd.)

Altamira, Tam. Feed: styrene, butadiene, acn. Product: SBR (45,000 mt/y).

INDUSTRIAS DERIVADAS DEL ETILENO SA

Puebla, Pue. Feed: ethylene oxide. Products: ethanolamines (7,200 mt/y), ethylene glycol (30,000 mt/y), propylene glycol (10,000 mt/y).

INDUSTRIAS RESISTOL SA

Coatzacoalcos. Feed: styrene. Product: phenol (38,000 mt/y), acrylics (16,500 mt/y).

Lecheria. Feed: acrylonitrile, butadiene, styrene. Products: ABS (24,000 mt/y), SBR (4,500 mt/y).

Lerma. Feed: butadiene, methanol, styrene monomer. Products: formaldehyde (28,500 mt/y), SBR (16,500 mt/y).

Xicohtzingo. Feed: styrene. Product: polystyrene (26,000 mt/y).

NEGROMEX SA

Salamanca. Feed: aromatic oils, butadiene, styrene. Products: carbon black (49,600 mt/y), rubber (70,000 mt/y).

PETROCEL SA

Altamira, Tamps. Feed: methanol, paraxylene. Products: dimethyl terephthalate (270,000 mt/y), terephthalic acid (55,000 mt/y).

PETROLEOS MEXICANOS

Azcapotzalco. Feed: benzene, propylene tet, refinery gas. Products: alkylbenzene (36,500 mt/y), propylene (27,000 mt/y), propylene tet (17,500 mt/y), heavy alkyl-aryl (3,700 mt/y).

Cadereyta, N.L. Feed: refinery gas. Product: propylene (45,000 mt/y).

Camargo, Chihuahua. Feed: natural gas. Product: ammonia (132,000 mt/y).

Ciudad Madero, Tamaulipas. Feed: benzene, butylenes, ethylene, refinery gas. Products: alkylbenzene (31,600 mt/y), butadiene (55,000 mt/y), ethylbenzene (39,400 mt/y), propylene (61,000 mt/y), propylene tet (19,000 mt/y), styrene (30,000 mt/y).

Cosolecaque, Veracruz. Feed: natural gas, propylene. Products: acrylonitrile (24,000 mt/y), ammonia (2,380,000 mt/y), paraxylene (40,000 mt/y).

La Cangrejera, Veracruz. Feed: benzene, ethylene, naphtha, propylene. Product: acetaldehyde (100,000 mt/y), aromatics mix (22,000 mt/y), benzene (275,000 mt/y), cumene (40,000 mt/y), ethylbenzene (187,500 mt/y), ethylene (500,000 mt/y), ethylene glycol (3,800 mt/y), ethylene oxide (100,000 mt/y), orthoxylene (55,000 mt/y), paraxylene (240,000 mt/y), id polyethylene (240,000 mt/y), propylene (26,900 mt/y), styrene (150,000 mt/y), toluene (365,000 mt/y), xylene mix (360,000 mt/y).

Minatitlan, Veracruz. Feed: benzene, ethylene, naphtha, refinery gas. Products: aromatics mix (44,000 mt/y), benzene (124,250 mt/y), cyclohexane (100,000 mt/y), ethylbenzene (17,550 mt/y), orthoxylene (11,250 mt/y), propylene (53,000 mt/y), toluene (100,000 mt/y), xylene mix (40,610 mt/y).

Morelos, Veracruz. Feed: ethane, ethylene. Product: acetaldehyde (150,000 mt/y), ethylene (500,000), ethylene glycol (135,000 mt/y), ethylene oxide (200,000 mt/y), propylene (26,900 mt/y), hd polyethylene (100,000 mt/y).

Pajaritos, Veracruz. Feed: ethylchloride, ethylene. Products: acetaldehyde (44,000 mt/y), ethylene (209,210 mt/y), ethylene dichloride (420,650 mt/y), ethylene oxide (28,000 mt/y), vinyl chloride (30,000 mt/y).

Poza Rica, Veracruz. Feed: ethylene. Products: ethylene (182,000 mt/y), id polyethylene (51,000 mt/y), hd polyethylene (100,000 mt/y).

Reynosa, Tamaulipas. Feed: ethylene. Products: ethylene (27,210 mt/y), id polyethylene (18,000 mt/y).

Salamanca, Guanajuato. Feed: natural gas, propylene. Products: ammonia (379,000 mt/y), isopropanol (15,000 mt/y), propylene (48,000 mt/y).

Salina Cruz, Oax. Feed: refinery gas. Product: propylene (45,000 mt/y).

San Martin, Texmelucan, Puebla. Feed: benzene, natural gas, propylene tet. Products: acrylonitrile (50,000 mt/y), alkylbenzene (70,000 mt/y), methanol (171,500 mt/y), propylene tet (80,000 mt/y), heavy alkyl-aryl (5,980 mt/y).

Tula, Hidalgo. Feed: ammonia, natural gas, propylene. Products: acrylonitrile (50,000 mt/y), propylene (45,000 mt/y).

POLICYD SA DE CV

Mexico City and Tampico. Feed: vinyl chloride monomer. Product: polyvinyl chloride (135,000 mt/y).

POLIMEROS DE MEXICO SA

Cautitlan. Feed: styrene. Product: polystyrene, expandable polystyrene.

Moyotzingo, Puebla. Feed: vinyl chloride. Product: polyvinyl chloride (30,000 mt/y).

Xicohtzingo. Feed: vinyl chloride. Product: polyvinyl chloride (30,000 mt/y).

POLIOLES SA DE CV

(60% Mexican shareholders, 40% BASF de Mexico)

Lerma (State of Mexico). Feed: ethylene oxide, propylene oxide. Products: ethylene glycol, propylene oxide.

POLIESTIRENO Y DERIVADOS SA de CV

Apizaco, Tlaxcala. Feed: styrene. Product: polystyrene (50,000 mt/y).

POLIVIN SA DE CV

Celaya, Guanajuato. Feed: methanol, vinyl acetate. Product: polyvinyl alcohol (2,400 mt/y).

SINTESIS ORGANICAS SA

Apizaco, Tlaxcala. Feed: orthoxylene. Product: phthalic anhydride (30,000 mt/y).

Puebla, Pue. Feed: orthoxylene. Products: phthalic anhydride (12,000 mt/y), plasticizers (7,000 mt/y).

UNIVEX SA—(DSM affiliate)

Salamanca, Gto. Product: caprolactam (50,000 mt/y).

MOROCCO

SNEP—Societe Nationale d'Electrolyse et de Petrochemie.

Mohammedia. Products: polyvinyl chloride (25,000 mt/y), vinyl acetate (25,000 mt/y).

NETHERLANDS

AKZO ZOUT CHEMIE NEDERLAND BV

Botlek. Feed: ethylene, chlorine, HCl. Product: vinyl chloride (500,000 mt/y).

AMMONIAK UNIE

(Kemira/BASF)

Pernis. Feed: natural gas. Product: ammonia (380,000 mt/y).

ARCO CHEMIE NEDERLAND LTD.

Rotterdam. Feed: isobutane and propylene. Products: TBA (648,000 mt/y), isobutylene (423,500 mt/y), MTBE (11,900 b/d), propylene glycol (71,500 mt/y), propylene oxide (270,000 mt/y).

BREDASE POLYSTYREEN MBV.

Breda. Feed: styrene. Product: polystyrene (150,000 mt/y).

CINDU CHEMICALS BV

Ulthoorn (near Amsterdam). Feed: coal tar. Product: naphthalene (10,000 mt/y).

DEGUSSA.

Botlek. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

DOW CHEMICAL EUROPE

Terneuzen. Products: benzene, butadiene, cumene, ethylene, ethylbenzene, ethylene glycol, ethylene oxide, id-ld polyethylene, polystyrene, propylene, SB-latex, styrene.

DSM

Chemical Products Division

South Limburg. Products: acetylene (3,300 mt/y), acrylonitrile (175,000 mt/y), caprolactam (300,000 mt/y), melamine (120,000 mt/y).

Chemische Industrie Rijnmond

Botlek. Feed: toluene. Product: phenol (100,000 mt/y).

Methanol Chemie Nederland VoF

Deilzijl and Rotterdam. Products: formaldehyde (120,000 mt/y), resins (200,000 mt/y).

Methanol VoF.

Deilzijl. Product: methanol (740,000 mt/y).

Polymer Division

South Limburg. Feed: C₄, C₅, naphtha, gas oil. Products: benzene (245,000 mt/y), butadiene (135,000 mt/y), EPDM rubber (120,000 mt/y), ethylene (970,000 mt/y), MTBE (135,000 mt/y), ld polyethylene (370,000 mt/y), hd polyethylene (220,000 mt/y), polypropylene (280,000 mt/y), propylene (485,000 mt/y), ABS (55,000 mt/y).

DSM AGRO BV

Gelsen. Feed: natural gas. Products: ammonia (800,000 mt/y), urea (480,000 mt/y).

Ijmuiden. Feed: natural gas. Product: ammonia (290,000 mt/y).

Rotterdam. Feed: natural gas. Product: ammonia (150,000 mt/y DSM—150,000 mt/y BASF).

HOECHST HOLLAND NV

Vlissingen. Feed: p-xylene, methanol. Product: dimethyl terephthalate (90,000 mt/y).

HYDRO AGRI SLUISKIL B.V.

Sluiskil. Feed: natural gas. Products: ammonia (1,500,000 mt/y), urea (800,000 mt/y).

ICI HOLLAND BV

Rozenburg. Product: polypropylene (120,000 mt/y).

KEMIRA BV

(subsidiary of Kemira Oy)

Rozenburg. Feed: natural gas. Products: ammonia (550,000 mt/y), urea (210,000 mt/y).

SHELL NEDERLAND CHEMIE BV

Moerdijk. Feed: gas oil, LPG, naphtha. Products: butadiene (115,000 mt/y), ethylbenzene (350,000 mt/y), ethylene (550,000 mt/y), ethylene glycol (160,000 mt/y), ethylene oxide (185,000 mt/y), propylene (300,000 mt/y), propylene oxide (125,000 mt/y), styrene (320,000 mt/y).

Pernis. Feed: naphtha. Products: acetone (150,000 mt/y), bisphenol A (90,000 mt/y), BR-latex (20,000 mt/y), ethylene glycol (55,000 mt/y), isopropanol (290,000 mt/y), MEK (60,000 mt/y), methyl isobutyl ketone (30,000 mt/y), isoprene rubber (40,000 mt/y), MTBE (125,000 mt/y), polyether polyols (80,000 mt/y), polypropylene (90,000 mt/y), polyvinyl chloride (200,000 mt/y), propylene (90,000 mt/y), SBR (120,000 mt/y).

UCAM VOF

(2/3 DSM, 1/3 Kemira)

Gelsen. Feed: natural gas. Product: ammonia (460,000 mt/y).

NEW ZEALAND

PETRALGAS CHEMICALS NZ LTD.

Walters. Feed: natural gas. Product: methanol (1,450 mt/d).

PETROCHEMICAL CORP. OF NZ LTD.

Kapuni. Feed: natural gas. Product: urea (165,000 mt/y).

NICARAGUA

QUÍMICA BORDEN CASA

Tipitapa. Feed: methanol. Product: formaldehyde (6,000 mt/y).

NIGERIA

NIGERIAN NATIONAL PETROLEUM CORP.

Ekpai and Kaduna. Feed: FCC decant oil,

benzene, ethylene, kerosene, refinery off gas. Products: alkylbenzene (30,000 mt/y), benzene (15,000 mt/y), carbon black (18,000 mt/y), polypropylene (35,000 mt/y).

NORWAY

I/S NORETYL

(51% Norsk Hydro, 49% Statoil)

Rafnes, Banlie. Feed: natural gas liquids. Products: ethylene (390,000 mt/y), propylene (70,000 mt/y).

NORSK HYDRO AS

Porsgrunn. Feed: vinyl chloride. Product: polyvinyl chloride (90,000 mt/y).

Rafnes, Bamble. Feed: chlorine, ethylene. Product: vinyl chloride (420,000 mt/y).

NORSK HYDRO NORWAY

Porsgrunn. Feed: natural gas liquids. Product: ammonia (420,000 mt/y).

NORSK KOKSVERK AS

Mo-i-Rana. Feed: coke oven gas. Products: ammonia (40,000 mt/y), benzene (5,000 mt/y), crude tar (16,000 mt/y).

PAKISTAN

DAWOOD HERCULES CHEMICALS LTD.

Chichoki Mailan. Feed: natural gas. Products: ammonia (200,000 mt/y), urea (378,500 mt/y).

EXXON CHEMICAL PAKISTAN LTD.

Daharki, Dist. Sukkur. Feed: natural gas. Products: ammonia (172,280 mt/y), urea (295,650 mt/y).

PERU

FERTILIZANTES SINTETICOS SA

Lima. Feed: residual oil. Product: ammonia (75 mt/d).

PETROPERU

(Licensee of Witco Corp.—Concarb Div.)

Negro de Humo plant, Talara. Feed: heavy aromatic oil. Product: carbon black (15,000 mt/y).

PETROLEOS DEL PERU

Talara. Feed: propane, propylene. Products: acetone (4,745 mt/y), ammonia (109,500 mt/y), carbon black (12,702 mt/y), isopropanol (12,775 mt/y), urea (186,150 mt/y).

PHILIPPINES

CHEMPHIL LMG INC.

San Pascual, Batangas. Feed: benzene, propylene tetramer. Product: alkylbenzene (25,400 mt/y).

COLUMBIAN CARBON PHILIPPINES INC.

Bataan. Feed: FCCU bottom oil. Product: furnace carbon black (17,000 mt/y).

PORTUGAL

COMPANHIA INDUSTRIAL DE RESINAS SINTETICAS (CIRES)

Estarreja. Feed: vinyl chloride. Product: polyvinyl chloride (85,000 mt/y).

COMPANHIA NACIONAL DE PETROQUÍMICA

EP-Sines. Feed: naphtha. Products: butadiene (40,000 mt/y), ethylene (300,000 mt/y), propylene (150,000 mt/y).

EPSI—Empresa de Polímeros de Sines

(86% Portuguese State, 13.2% Cdf Chimie)

Sines. Feed: ethylene, propylene. Products: polyethylene (180,000 mt/y), polypropylene (50,000 mt/y).

PETROGAL

Leça da Palmeira. Feed: reformate. Products: benzene (44,000 mt/y), orthoxylene (40,000 mt/y), paraxylene (90,000 mt/y), toluene (140,000 mt/y), xylene mix (10,000 mt/y).

PETROQUÍMICA E GÁS DE PORTUGAL EP

Cabo Ruivo. Feed: alcohol, naphtha, orthoxylene. Products: ammonia (90,000 mt/y), phthalic anhydride (15,000 mt/y), phthalates (20,000 mt/y).

QUIMIGAL—Química de Portugal SA

Barreiro-Lavradio. Feed: heavy fuel oil. Products: ammonia (290,000 mt/y), urea (80,000 mt/y).

PUERTO RICO

PHILLIPS PUERTO RICO INC.

Guayama. Feed: naphtha. Products: benzene (411,000 mt/y), cyclohexane (296,000 mt/y), toluene (336,000 mt/y), orthoxylene (59,000 mt/y), paraxylene (213,000 mt/y).

QATAR

QATAR FERTILIZER CO.

(75% Qatar General Petroleum Corp., 25% Norsk Hydro AS)

Umm Said. Feed: natural gas. Products: ammonia (725,000 mt/y), urea (780,000 mt/y).

QATAR PETROCHEMICAL CO. LTD.

(80% QPC, 10% ATOCHEM, 10% ENICHEM)

Umm Said. Feed: ethane. Products: ethylene (300,000 mt/y), ld polyethylene (180,000 mt/y), propylene (6,000 mt/y), sulfur (50,000 mt/y).

SAUDI ARABIA

AL-JUBAIL FERTILIZER CO.

(Sabic with Taiwan Fertilizer Co.)

Al-Jubail. Feed: methane. Products: ammonia (300,000 mt/y), urea (600,000 mt/y).

AL-JUBAIL PETROCHEMICAL CO.

(50% Exxon Chemical Co, 50% SABIC)

Jubail. Feed: ethylene. Products: ld polyethylene (390,000 mt/y).

ARABIAN PETROCHEMICAL CO.

(100% Sabic)

Al-Jubail. Feed: ethane, styrene. Products: ethylene (650,000 mt/y), polystyrene (100,000 mt/y), butene-1 (50,000 mt/y).

EASTERN PETROCHEMICAL CO.

(Sabic, Mitsubishi-led Japanese consortium)

Al-Jubail. Feed: ethylene. Products: ethylene glycol (452,300 mt/y), ld polyethylene (184,300 mt/y).

IBN AL-BAYTAR NATIONAL CHEMICAL FERTILIZER CO.

(50% SABIC & 50% SAFCO)

Al-Jubail. Feed: methane, sulfuric acid, phosphoric acid, potash. Product: ammonia (500,000 mt/y), urea (500,000 mt/y), compound fertilizers (810,000 mt/y).

IBN HAYYAN NATIONAL PLASTIC CO.

Al-Jubail. Feed: ethylene, ethylene dichloride. Products: polyvinyl chloride (200,000 mt/y), vinyl chloride (300,000 mt/y).

IBN-SINA NATIONAL METHANOL CO.

(25% Celanese, 25% Texas Eastern, 50% SABIC)

Al-Jubail. Feed: methane. Product: methanol (770,000 mt/y).

IBN ZAHR SAUDI EUROPEAN PETROCHEMICAL CO.

(70% SABIC & 30% Apicorp, Ecofuel and Neste Oy)

Al-Jubail. Feed: methanol, butane. Product: methyl-ter-butyl ether (500,000 mt/y).

PETROMIN SHELL REFINING CO.

(Shell 50%, Petromin 50%)

Al Jubail. Product: benzene (245,000 mt/y).

SAUDI ARABIAN FERTILIZER CO.

(Sabic, Safco employees, private Saudi investors)

Al-Dammam-Khobar Highway. Feed: methane. Products: ammonia (200,000 mt/y), methanol (20,000 mt/y), urea (330,000 mt/y).

SAUDI METHANOL CO.

(Sabic, Mitsubishi-led Japanese consortium)
Al-Jubail. Feed: methane. Product: methanol (640,000 mt/y).

SAUDI PETROCHEMICAL CO.

(50% Pecten Arabian Co.—subsidiary of Shell Oil U.S., 50% SABIC)

Al-Jubail. Feed: ethane, benzene. Products: ethanol (300,000 mt/y), ethylene (760,000 mt/y), ethylene dichloride (560,000 mt/y), styrene (360,000 mt/y).

SAUDI YANBU PETROCHEMICAL CO.

(50% Mobil Oil Corp., 50% SABIC)
Yanbu. Feed: ethane. Products: ethylene (720,000 mt/y), ethylene glycol (340,000 mt/y), hd polyethylene (500,000 mt/y).

SINGAPORE

ETHYLENE GLYCOLS SINGAPORE PTY. LTD.
(50% Government, 30% Japanese interests, 20% Shell)

Pulau Ayer Merbau. Products: ethylene glycol (88,000 mt/y), ethylene oxide.

PHILLIPS PETROLEUM SINGAPORE CHEMICALS LTD. (60% Phillips Petroleum International Corp., 25% Temasek Holdings Ltd., 10% Sumitomo Chemicals Co. Ltd., 5% Development Bank of Singapore Ltd.)

Singapore. Feed: ethylene. Product: hd polyethylene (170,000 mt/y).

SHELL EASTERN PETROLEUM PTY. LTD.
(100% Shell)

Pulau Bukom. Products: toluene, xylene mix, solvents.

SOUTH AFRICA

AECI LTD.

Midland, Sasolburg. Feed: coal based acetylene, ethylene. Products: acetylene (59,000 mt/y), ethylene dichloride (80,000 mt/y), ld polyethylene (90,000 mt/y), ld polyethylene (100,000 mt/y), polyvinyl chloride (163,000 mt/y), solvents (22,000 mt/y), vinyl chloride (170,000 mt/y).

Modderfontein. Feed: coal. Products: ammonia (1,000 mt/d), methanol (50 mt/d).

KARBOCHEM PTY. LTD.

(division of Sentrachem)

Newcastle. Feed: butadiene, styrene. Products: polybutadiene (32,000 mt/y), SBR (32,000 mt/y).

Sasolburg. Product: alkylbenzene (18,000 mt/y), SBR (32,000 mt/y).

KYNOCHEM FERTILIZER LTD.

Millerton. Feed: refinery gas. Product: ammonia (80,000 mt/y).

NATIONAL CHEMICAL PRODUCTS LTD

(division of Sentrachem)

Germiston and Durban. Feed: benzene, molasses, naphthalene, orthoxylene. Products: acetaldehyde (15,000 mt/y), acetic acid (12,000 mt/y), ethanol (45,000 mt/y), formaldehyde (22,000 mt/y), maleic anhydride (4,000 mt/y), phthalic anhydride (32,000 mt/y).

SAFRIPOL PTY.

(50% Hoechst, 50% Sentrachem)

Sasolburg. Feed: ethylene, propylene. Products: hd polyethylene (85,000 mt/y), polypropylene (44,000 mt/y).

SASOL LTD.

Sasolburg and Secunda. Feed: coal. Product: ethylene (400,000 mt/y), propylene (150,000 mt/y), polypropylene (120,000 mt/y).

SENTRACHEM SPECIALTIES DIVISION

Durban and Germiston. Products: alkyls, polyester, polystyrene.

SPAIN

AISSONDEL SA

Monzón (Huesca). Feed: acrylonitrile, butadi-

ene, styrene, vinyl chloride monomer. Products: ABS-SAN (15,000 mt/y), polystyrene (10,000 mt/y), polyvinyl chloride (60,000 mt/y), expandable polystyrene (10,000 mt/y).

Vilaseca (Tarragona). Feed: ethylene, chlorine. Products: polyvinyl chloride (90,000 mt/y), vinyl chloride monomer (150,000 mt/y).

ATOACHEM

Prat de Llobregat. Feed: styrene. Product: ABS with compounds (8,000 mt/y), polystyrene with compounds (60,000 mt/y).

BASF ESPANOLA SA

(wholly owned by BASF)

Tarragona. Feed: acrylates, butadiene, naphtha, orthoxylene, propylene, styrene. Products: oxoalcohols-2-ethylhexanol (65,000 mt/y), phthalic anhydride (16,500 mt/y), polypropylene (30,000 mt/y), polystyrene (41,500 mt/y), plasticizers (40,000 mt/y), solvents (8,000 mt/y), ABS, polyamide (9,800 mt/y).

BORDEN ESPANA SA

Erandio. Feed: methanol. Product: formaldehyde (70,000 mt/y).

BRILEN SA

Barbaastro. Feed: polyethylene terephthalate. Products: methanol (7,000 mt/y), polyester (25,000 mt/y).

CALATRAVA SA

Puertollano. Products: butadiene (32,000 mt/y), hd polyethylene (60,000 mt/y).

Santander. Products: carbon black (37,000 mt/y), SBR (82,000 mt/y).

Tarragona. Products: butadiene (100,000 mt/y), polyethylene (60,000 mt/y).

CARBESA—Carbon Black Espanola SA

(100% Repsol Quimica)

Algeciras. Feed: heavy aromatic oils. Product: carbon black (25,000 mt/y).

CEPSA—Compañía Española de Petroleos SA

Luchana, Vizcaya. Feed: alcohol, orthoxylene. Products: phthalic anhydride (16,000 mt/y), plasticizers (40,000 mt/y).

San Roque, Cádiz. Feed: naphtha. Products: aromatics mix (20,000 mt/y), benzene (80,000 mt/y), maleic anhydride (13,000 mt/y), orthoxylene (40,000 mt/y), paraxylene (34,000 mt/y), phthalic anhydride (20,000 mt/y), propylene (60,000 mt/y), toluene (130,000 mt/y), xylene mix (120,000 mt/y), solvents (90,000 mt/y).

DOW CHEMICAL IBERICA SA

Billao. Products: polystyrene (67,000 mt/y).
Tarragona. Products: ethylene (465,000 mt/y), hd-ll polyethylene (50,000 mt/y), ld polyethylene (110,000 mt/y), propylene (236,000 mt/y), pyrolysis gasoline (412,000 mt/y).

ENFERSA—Empresa Nacional de Fertilizantes SA

Cartagena, Murcia. Feed: natural gas. Products: ammonia (240,000 mt/y), urea (145,000 mt/y).

Puertollano, Ciudad Real. Feed: naphtha. Products: ammonia (180,000 mt/y), urea (125,000 mt/y).

ERKOL

(joint venture Erkima Rhone Poulenc Quimica)
Tarragona. Feed: vinyl acetate, methanol. Product: polyvinyl alcohol (15,000 mt/y).

ERTOIL SA

La Rabida, Huelva. Feed: naphtha. Products: benzene (140,000 mt/y), cyclohexane (80,000 mt/y).

HINDUSTRIAL SA

Morell. Feed: vcm. Product: polyvinyl chloride.

INDUSTRIAS QUIMICAS ASOCIADOS SA.

(100% Shell)

Tarragona. Feed: olefins. Products: acetone (8,000 mt/y), ethylene glycol (60,000 mt/y), ethylene oxide (100,000 mt/y), isopropanol (35,000 mt/y).

INTERQUISA—Intercontinental Quimica SA

(50% Cepasa, 50% Amoco International)

San Roque. Feed: paraxylene. Products: dimethyl terephthalate (90,000 mt/y), terephthalic acid (200,000 mt/y).

PAULAR SA

Morell, Tarragona. Products: acrylonitrile (90,000 mt/y), methyl methacrylate (30,000 mt/y).

PETROQUIMICA ESPANOLA SA

(100% Cepasa)

San Roque (Cádiz). Feed: benzene, kerosine, sulfur. Product: alkylbenzene (180,000 mt/y).

PRODUCTOS QUIMICOS DEL MEDITERRANEO SA

El Grao, Castellon de la Plana. Feed: cyclohexane. Product: caprolactam (45,000 mt/y).

REPSOL PETROLEO SA

La Coruña. Feed: isobutylene, methanol. Products: MTBE (32,000 mt/y), propylene (50,000 mt/y).

Puertollano. Feed: naphtha, refinery gases. Products: benzene (90,000 mt/y), ethylene (240,000 mt/y), propylene (180,000 mt/y).

Tarragona. Feed: isobutylene, LPG, methanol, naphtha. Products: ethylene (390,000 mt/y), MTBE (52,000 mt/y), propylene (180,000 mt/y).

REPSOL QUIMICA SA

Puertollano. Feed: olefins cracker. Products: butadiene (32,000 mt/y), ld polyethylene (215,000 mt/y), hs polyethylene (75,000 mt/y), polypropylene (80,000 mt/y), propylene glycol (18,000 mt/y), propylene oxide (50,000 mt/y), styrene (110,000 mt/y).

Santander. Feed: butadiene, styrene. Products: carbon black (65,000 mt/y), SBR-PB (60,000 mt/y).

Tarragona. Feed: olefins cracker. Products: acrylonitrile (95,000 mt/y), butadiene (100,000 mt/y), ld polyethylene (245,000 mt/y), hd polyethylene (140,000 mt/y), polypropylene (67,500 mt/y).

RESISA—Resinas Sintéticas SA

San Ceoni, Barcelona. Feed: maleic anhydride, phthalic anhydride, paraxylene, solvents. Products: polyester (17,000 mt/y), resins: (alkyl 13,000 mt/y, phenolic 2,000 mt/y, acrylic 1,000 mt/y, p.e.t. 4,000 mt/y).

RIO RODANO SA

Barcelona. Product: vinyl compound (5,000 mt/y).

Hernani, Guipúzcoa. Feed: vinyl chloride monomer. Products: polyvinyl chloride (40,000 mt/y).

Miranda de Ebro, Burgos. Feed: vinyl chloride monomer. Products: polyvinyl chloride (80,000 mt/y), plasticizers (18,000 mt/y), vinyl compounds (20,000 mt/y).

SEVINIL

Dosbarrenos, Sevilla. Product: vinyl chloride (15,000 mt/y).

TARRAGONA QUIMICA SA

(100% Hoechst)

Tarragona. Feed: olefins. Products: hd polyethylene (100,000 mt/y), polypropylene (90,000 mt/y), vinyl acetate (75,000 mt/y).

VINICLOR SA

Morell, Barcelona. Feed: ethylene. Product: vinyl chloride (240,000 mt/y).

SRI LANKA

STATE FERTILIZER MANUFACTURING CORP.

Sapugaskanda. Feed: naphtha. Products: ammonia (86,476 mt/y), urea (138,458 mt/y).

SUDAN

SUDAN-REN CHEMICALS & FERTILIZER LTD.
Khartoum. Feed: naphtha. Product: ammonia (175 mt/d).

SWEDEN

DEGUSSA.

Malmö. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

DOW CHEMICAL

Norrköping. Product: SB-latex.

HYDRO PLAST AB

Stenungsund. Feed: ethylene. Products: polyvinyl chloride (115,000 mt/y), vinyl chloride (110,000 mt/y).

NESTE OXO AB

Nol. Feed: orthoxylene. Product: phthalic anhydride (25,000 mt/y).

Örnakölvik. Feed: butyraldehyde. Product: butanol (40,000 mt/y).

Stenungsund. Feed: phthalic anhydride, propylene. Products: butanol (40,000 mt/y), butyraldehyde (165,000 mt/y), oxoalcohols (100,000 mt/y), phthalic anhydride (25,000 mt/y).

NESTE POLYESTER AB

Nol. Product: polyester (20,000 mt/y).

NESTE POLYETEN AB

Stenungsund. Feed: ethylene. Product: id-hd-md-ld polyethylene (440,000 mt/y).

PERSTORP AB

Perstorp. Feed: methanol. Products: formaldehyde (200,000 mt/y), polyols, resins.

STATOIL PETROKEMI AB.

Stenungsund. Feed: naphtha, propane. Products: ethylene (370,000 mt/y), fuel oils (40,000 mt/y), propylene (180,000 mt/y), pyrolysis gasoline (130,000 mt/y).

SVENSKA POLYSTYREN FABRIKEN AB

Trelleborg. Feed: styrene. Product: polystyrene (80,000 mt/y).

SWITZERLAND

EVC

(50% ICI, 50% Enichem)

Sina. Product: polyvinyl chloride (45,000 mt/y).

LOHZA AG

Viap. Feed: LVN-LPG. Products: acetaldehyde, acetic acid, acetic anhydride, acetylene (15,000 mt/y), ammonia (40,000 mt/y), aniline (3,000 mt/y), ethylene (30,000 mt/y), formaldehyde.

SYRIA

GENERAL FERTILIZER CO.

Katteneh-Hama. Feed: natural gas. Products: ammonia (250,000 mt/y), ethylene (250,000 mt/y), urea (250,000 mt/y).

THAILAND

VIYTHAI CY LTD.

(subsidiary of Solvay & Cie)

Map Ta Phut. Feed: vinyl chloride. Product: polyvinyl chloride.

TRINIDAD

FEDERATION CHEMICALS LTD.

(subsidiary of W.R. Grace & Co.)

Point Lisas. Feed: natural gas. Product: ammonia (231,300 mt/y).

FERTILIZERS OF TRINIDAD & TOBAGO LTD.

Point Lisas. Feed: anhydrous ammonia. Product: ammonia (780,000 mt/y).

TRINIDAD NITROGEN

(49% W. R. Grace & Co., and Government of Trinidad-Tobago)

Point Lisas. Feed: natural gas. Product: ammonia (816,460 mt/y).

TURKEY

ALPET—Allaga Petrokimya San Ve Tic AS

Allaga. Feed: naphtha. Products: acrylonitrile (70,000 mt/y), benzene (124,000 mt/y), butadiene (80,000 mt/y), ethylene (300,000 mt/y), ethylene dichloride (165,000 mt/y), ethylene glycol (68,000 mt/y), orthoxylene (65,000 mt/y), paraxylene (132,000 mt/y), phthalic anhydride (30,000 mt/y), id polyethylene (150,000 mt/y), hd polyethylene (40,000 mt/y), polypropylene (60,000 mt/y), polyvinyl chloride (100,000 mt/y), propylene (138,000 mt/y), terephthalic acid (70,000 mt/y), toluene (40,000 mt/y), vinyl chloride (105,000 mt/y).

BASF-SUMERBANK TURK KIMYA

SANAYII AS

Gebze. Feed: methanol. Product: formaldehyde (32,000 mt/y).

SASA ARTIFICIAL & SYNTHETIC FIBERS INC.

Adana. Feed: methanol, monoethylene glycol, paraxylene. Products: dimethyl terephthalate (80,000 mt/y), polyester (100,000 mt/y).

YARPET—Yarimca Petrokimya

Yarimca-izmit. Feed: naphtha, NaCl, aromatic oil, benzene, C₂, ammonia, sulfur. Products: alkylbenzene (20,000 mt/y), butadiene (33,000 mt/y), caprolactam (25,000 mt/y), carbon black (30,000 mt/y), ethylene (55,000 mt/y), fuel oils (6,850 mt/y), polybutadiene (13,500 mt/y), id polyethylene (24,300 mt/y), polystyrene (15,000 mt/y), polyvinyl chloride (46,800 mt/y), propylene (39,600 mt/y), pyrolysis gasoline (60,000 mt/y), styrene (19,450 mt/y), vinyl chloride (48,600 mt/y), SBR (32,150 mt/y).

UNITED KINGDOM

ATOACHEM

Stalybridge. Product: polystyrene with compounds (80,000 mt/y).

BORDEN (U.K.) LTD.

Peterlee. Feed: methanol. Products: formaldehyde (40,000 mt/y), resins.

Southampton. Feed: methanol. Product: formaldehyde (25,000 mt/y).

BP CHEMICALS LTD.

Baglan Bay. Products: benzene concentrate (150,000 mt/y), butadiene (60,000 mt/y), ethanol (155,000 mt/y), ethylene (350,000 mt/y), isopropanol (85,000 mt/y), styrene (275,000 mt/y), toluene (6,000 mt/y), vinyl acetate (85,000 mt/y).

Carshalton. Product: solvents and plasticizers (15,000 mt/y).

Barry. Product: resins (40,000 mt/y).

Grangemouth. Products: acetone (25,000 mt/y), acrylonitrile (70,000 mt/y), benzene (250,000 mt/y), butadiene (48,000 mt/y), ethanol (155,000 mt/y), ethylene (270,000 mt/y), polybutylenes (50,000 mt/y), hJ polyethylene (250,000 mt/y), id polyethylene (125,000 mt/y).

Hull. Products: acetic acid (200,000 mt/y), acetic acid/acetic anhydride (175,000 mt/y), acetone (46,000 mt/y), phthalic anhydride (70,000 mt/y).

Wilton. Products: butadiene (90,000 mt/y), ethylene (155,000 mt/y), id polyethylene (85,000 mt/y).

CIBA-GEIGY LTD.

Duxford, Cambridge. Feed: methanol. Product: formaldehyde (120,000 mt/y).

COLUMBIAN CHEMICALS CO.

Bristol, England. Product: carbon black (33,178 mt/y).

CONOCO LTD.

South Killingholme, Humberside. Feed: reformate. Product: benzene (150,000 mt/y), propylene (80,000 mt/y), dimethylether (15,000 mt/y).

DOW CHEMICAL

Barry. Product: polystyrene.

ENICHEM ELASTOMERS LTD.

Grangemouth, Scotland. Feed: butadiene, styrene, ethylene, propylene. Products: polybutadiene (45,000 mt/y), polypropylene (5,000 mt/y), SBR (30,000 mt/y), block-SBR (15,000 mt/y), ethylene-propylene rubber (15,000 mt/y).

Hythe, Hampshire. Feed: acrylonitrile, butadiene, ethylbenzene. Product: rubber (150,000 mt/y).

EXXON CHEMICAL LTD.

Fawley. Feed: petroleum fractions. Products: higher olefins (230,000 mt/y), butyl-halobutyl rubber (60,000 mt/y).

EXXON CHEMICAL OLEFINS INC.

Fawley. Feed: petroleum fractions. Products: butadiene (30,000 mt/y), ethylene (105,000 mt/y), isobutylene (65,000 mt/y), propylene (100,000 mt/y).

Mossmorran, Fife. Feed: ethane. Product: ethylene (650,000 mt/y).

IMPERIAL CHEMICAL INDUSTRIES LTD.

Polymers Group

Billingham. Products: ammonia, methanol (500,000 mt/y), oxoalcohols (250,000 mt/y), phenol (80,000 mt/y).

North Tees. Products: benzene (525,000 mt/y), cumene (135,000 mt/y), cyclohexane (300,000 mt/y), toluene (330,000 mt/y), xylene mix (330,000 mt/y), ethylbenzene (45,000 mt/y).

Wilton. (80% ICI—20% BP). Feed: naphtha, propane. Products: butadiene (100,000 mt/y), ethylene (775,000 mt/y), propylene (350,000 mt/y), ethylene dichloride (250,000 mt/y), ethylene glycol (85,000 mt/y), ethylene oxide (240,000 mt/y), formaldehyde, paraxylene (340,000 mt/y), polyester (90,000 mt/y), polypropylene (150,000 mt/y), terephthalic acid (550,000), polyamide (240,000 mt/y).

IMPERIAL CHEMICAL INDUSTRIES LTD.

Barry. Product: polyvinyl chloride (90,000 mt/y).

Caster-Kellner, Runcorn. Product: vinyl chloride monomer (180,000 mt/y), ethylene dichloride (450,000 mt/y).

Hillhouse, Lancashire. Product: vinyl chloride (180,000 mt/y).

KEMIRA INCE LTD.

Ince. Feed: natural gas. Product: ammonia (550,000 mt/y).

KEMIRA LTD.

Hull. Feed: hydrogen. Product: ammonia (230,000 mt/y).

NORSK HYDRO POLYMERS LTD.

Aycliffe. Feed: vinyl chloride. Product: polyvinyl chloride (130,000 mt/y).

SEVALCO LTD.

(50% Columbian Chemicals, 50% Phillips Petroleum)

Avonmouth, Bristol. Feed: heavy aromatic oils. Product: furnace and thermal carbon black (70,000 mt/y).

SHELL CHEMICALS U.K. LTD.

Carrington. Feed: ethylene, ethylene oxide, propylene, propylene oxide, styrene. Products: alcohol ethoxylates (60,000 mt/y), id polyethylene (105,000 mt/y), polypropylene (110,000 mt/y), polystyrene (50,000 mt/y).

Shell Haven. Feed: benzene. Product: linear alkylbenzene (120,000 mt/y).

Stanlow. Feed: refinery gases. Products: acetone (40,000 mt/y), benzene (450,000 mt/y), butanol (30,000 mt/y), isopropanol (100,000 mt/y), propylene (70,000 mt/y), higher olefins (220,000 mt/y), solvents.

UKF FERTILIZERS LTD.

Ince, Chester. Feed: natural gas. Product: ammonia (325,000 mt/y).

UNITED STATES

AGRIC.

Donaldsonville, La. Feed: natural gas. Products: ammonia (410,000 mt/y), urea (205,000 mt/y).

AGRICULTURAL MINERALS CORP.

(one of the Williams Companies)

Blytheville, Ark. Feed: natural gas. Products: ammonia (320,000 mt/y), urea (345,000 mt/y).

Verdigris, Okla. Feed: natural gas. Products: ammonia (865,000 mt/y), urea ammonium nitrate solution (1,590,000 mt/y).

AIR PRODUCTS AND CHEMICALS INC.

Calvert City, Ky. Feed: vinyl acetate, vinyl chloride. Products: acetic acid (54,545 mt/y), polyvinyl alcohol (52,272 mt/y), polyvinyl chloride (136,116 mt/y).

New Orleans, La. Feed: natural gas. Product: ammonia (280,000 mt/y).

Pensacola, Fla. Feed: ammonia, natural gas, vinyl chloride. Products: ammonia (94,000 mt/y), methanol (180,000 mt/y), polyvinyl chloride (90,700 mt/y), urea (28,000 mt/y).

ALLIED-SIGNAL INC.

Baton Rouge, La. Product: hd polyethylene (521,629 mt/y).

Chesterfield, Va. and Columbia, S.C. Product: nylons (276,781 mt/y).

Geismar, La. Product: HF (85,754 mt/y).

Hopewell, Va. Product: ammonia (364,686 mt/y), caprolactam (290,000 mt/y).

Moncure, N.C. Product: polyester (50,802 mt/y).

Philadelphia, Pa. Products: acetone (225,000 mt/y), phenol (365,000 mt/y).

AMERICAN CYANAMID CO.

Fortier, La. Feed: natural gas, propylene. Products: acrylonitrile (160,000 mt/y), ammonia (385,000 mt/y), melamine (55,000 mt/y).

AMOCO CHEMICAL CO.

Cedar Bayou, Tex. Feed: propylene. Product: polypropylene (226,800 mt/y).

Chocolate Bayou, Tex. Feed: ethane, ethylene, naphtha, propane, propylene. Products: aromatics (82,000 mt/y), butadiene (81,600 mt/y), ethylene (1,081,400 mt/y), polypropylene (372,800 mt/y), propylene (415,000 mt/y).

Cooper River, S.C. Feed: paraxylene. Product: terephthalic acid (728,000 mt/y).

Decatur, Ala. Feed: paraxylene, xylene. Products: paraxylene (453,600 mt/y), terephthalic acid (884,500 mt/y).

Joliet, Ill. Feed: butane, metaxylene, styrene. Products: isophthalic acid (79,400 mt/y), maleic anhydride (39,000 mt/y), polystyrene (94,300 mt/y), trimellitic anhydride (47,600 mt/y).

Texas City, Tex. Feed: aromatics, benzene, butylenes, ethylene, propylene, xylene. Products: metaxylene (102,000 mt/y), paraxylene (625,500 mt/y), polyalpha-methyl styrene (13,600 mt/y), polyisobutylene (88,500 mt/y), propylene (303,500 mt/y), solvents (161,500 mt/y), styrene (353,300 mt/y).

Torrance, Calif. Feed: styrene. Product: polystyrene (14,000 mt/y).

Whiting, Ind. Feed: butylenes, methanol. Product: MTBE (162,800 mt/y), polyisobutylene (74,800 mt/y).

Willow Springs, Ill. Feed: styrene. Products: polystyrene (34,000 mt/y).

AMOCO OIL CO.

Texas City, Tex. Feed: crude oil. Products: benzene (460,000 mt/y), toluene (910,000 mt/y), xylene mix (780,000 mt/y).

Whiting, Ind. Feed: crude oil. Products: propylene (170,000 mt/y), xylene mix (646,000 mt/y).

ARCO CHEMICAL CO.

Bayport, Tex. Feed: isobutane, propylene. Products: butyl alcohol (1,434,000 mt/y), isobutylene (187,500 mt/y), propylene glycol (216,000 mt/y), propylene oxide (606,500 mt/y).

Beaver Valley, Pa. Feed: propylene, ethylene,

benzene. Products: polystyrene (237,500 mt/y), styrene monomer (105,000 mt/y).

Channelview, Tex. Feed: isobutane, propylene. Products: butanediol (37,500), ethylbenzene (917,500 mt/y), MTBE (30,000 b/d), polyols (112,500 mt/y), propylene oxide (300,000 mt/y), styrene monomer (700,000 mt/y).

Painesville, Ohio. Product: polystyrene (35,000 mt/y).

ARISTECH CHEMICAL CORP.

Florence, Ky. Feed: methyl methacrylate. Product: acrylics (17,237 mt/y).

Haverhill, Ohio. Feed: ammonia, cumene. Products: acetone (178,717 mt/y), bisphenol A (97,523 mt/y), phenol (285,756 mt/y).

LaPorte, Tex. Feed: propylene. Product: polypropylene (172,367 mt/y).

Neal, West Va. Feed: propylene. Product: polypropylene (140,615 mt/y).

Neville Island, Pa. Feed: alcohols, dibasic acids. Products: maleic anhydride (19,051 mt/y), plasticizers (95,255 mt/y).

Neville Island, Pa., Jacksonville, Ark., Colton, Calif., Bartow, Fla. Feed: dibasic acids, alcohols, glycols, styrene. Product: polyester (104,327 mt/y).

Pasadena, Tex. Feed: orthoxylene, propylene, natural gas. Product: phthalic anhydride (95,255 mt/y), 2-ethylhexanol (86,183 mt/y).

ASHLAND CHEMICAL CO.

Cattlettsburg, Ky. Feed: crude oil, coal tar light oil. Products: aromatics mix (10,900 mt/y), benzene (160,000 mt/y), cumene (238,000 mt/y), toluene (110,000 mt/y), xylene mix (90,000 mt/y).

Neal, W. Va. Feed: n-butane. Product: maleic anhydride (29,492 mt/y).

Plequemine, La. Feed: natural gas. Product: methanol (390,000 mt/y).

ATLAS POWDER CO.

(subsidiary of Tyler Corp.)

Joplin, Mo. Feed: natural gas. Products: ammonia (355 mt/d), urea (195 mt/d).

BASF CORP.

Chemicals Division

Freeport, Tex. Products: acrylic-acrylates (280 mt/y), butanol-ethylhexanol (100 mt/y), caprolactam (159 mt/y).

Geismar, La. Products: ethylene glycol (177 mt/y), ethylene oxide (218 mt/y), ethylene (230,000 mt/y).

South Brunswick, N.J. Product: expandable polystyrene (80 mt/y).

S. Kearny, N.J. Products: phthalic anhydride (80 mt/y), plasticizers (109 mt/y).

Various location: Products: nylons (223 mt/y), polyester (18 mt/y).

BISON NITROGEN PRODUCTS CO.

(65% Terra International, 35% W. R. Grace)

Woodward, Okla. Feed: ammonia, carbon dioxide. Product: urea (305 mt/d).

BORDEN CHEMICAL CO.

Chemical Division

Demopolis, Ala. Feed: methanol. Product: formaldehyde (36,000 mt/y).

Diboll, Tex. Feed: methanol. Product: formaldehyde (57,000 mt/y).

Fayetteville, N.C. Feed: methanol. Product: formaldehyde (193,000 mt/y).

Fremont, Calif. Feed: methanol. Product: formaldehyde (80,000 mt/y).

Kent, Wash. Feed: methanol. Product: formaldehyde (43,000 mt/y).

La Grande, Ore. Feed: methanol. Product: formaldehyde (33,000 mt/y).

Louisville, Ky. Feed: methanol. Product: formaldehyde (52,000 mt/y).

Missoula, Mont. Feed: methanol. Product: formaldehyde (62,000 mt/y).

Sheboygan, Wis. Feed: methanol. Product: formaldehyde (78,000 mt/y).

Springfield, Ore. Feed: methanol. Product: formaldehyde (138,000 mt/y).

Vicksburg, Miss. Feed: methanol. Product: formaldehyde (32,000 mt/y).

BORDEN CHEMICALS-PLASTICS OPERATING LTD. PARTNERSHIP

Geismar, La. Feed: natural gas, ethylene, chlorine. Products: acetylene (91,000 mt/y), ammonia (363,000 mt/y), formaldehyde (285,000 mt/y).

methanol (104,000 mt/y), polyvinyl chloride (200,000 mt/y), urea (209,000 mt/y), vinyl chloride (422,000 mt/y).

Illioopolis, Ill. Feed: vinyl chloride. Product: polyvinyl chloride (172,000 mt/y).

BORG-WARNER CHEMICALS

North American plants. Product: ABS (362,874 mt/y).

Carville, La. (with Cosden Oil & Chemical). Feed: benzene, ethylene. Products: styrene (340,195 mt/y), toluene (17,000 mt/y).

Geismar, La. (with Union Texas Petroleum and BASF). Feed: ethane, propane. Products: butadiene (2,722 mt/y), ethylene (54,431 mt/y), propylene (2,558 mt/y). Note: Borg-Warner share only.

BP CHEMICALS AMERICA

Green Lake, Tex. Feed: ammonia, propylene. Product: acrylonitrile (325,000 mt/y).

Lima, Ohio. Feed: ammonia, natural gas, propylene. Products: acrylonitrile (160,000 mt/y), benzene (330,000 mt/y).

BP OIL CO.

Belle Chase, La. Feed: reformate, toluene. Products: benzene (250,000 mt/y), xylene mix (315,000 mt/y).

Lima, Ohio. Feed: refinery gases, reformate, toluene. Products: benzene (330,000 mt/y), toluene (315,000 mt/y).

CABOT CORP.

Pampa, Tex.; Franklin and Willie Plette, La.; and Waverly, W. Va. Feed: gas and petroleum fractions. Product: carbon blacks (furnace process and thermal) (440,000 mt/y).

CAIN CHEMICAL INC.

(subsidiary of OxyChem)

Bayport, Tex. Feed: ethylene. Products: ethylene glycol (265,000 mt/y), ethylene oxide (285,000 mt/y).

Beaumont, Tex. Feed: ethylene. Products: ethylene glycol (360,000 mt/y), ethylene oxide (285,000 mt/y).

Chocolate Bayou, Tex. Feed: gas oil, drip oil, ethane, naphtha, toluene. Products: aromatics (335,000 mt/y), butadiene (60,000 mt/y), ethylene (500,000 mt/y), propylene (300,000 mt/y).

Corpus Christi, Tex. Feed: ethane, gas oil, naphtha, propane, toluene. Products: aromatics (220,000 mt/y), butadiene (90,000 mt/y), ethylene (745,000 mt/y), ethylene dichloride (430,000 mt/y), propylene (295,000 mt/y).

Lake Charles, La. Feed: ethane, propane. Products: ethylene (355,000 mt/y), propylene (85,000 mt/y).

Metagorda, Tex. Feed: ethylene. Product: hd polyethylene (475,000 mt/y).

Orange, Tex. Feed: ethylene. Product: hd polyethylene (115,000 mt/y).

Victoria, Tex. Feed: ethylene. Product: hd polyethylene (200,000 mt/y).

CAPE INDUSTRIES

(joint venture Hoechst-Celanese and American Petrofina)

Wilmington, N.C. Feed: methanol, paraxylene. Products: dimethyl terephthalate (640,000 mt/y), terephthalic acid (140,000 mt/y).

CERTAINTED CORP.

Lake Charles, La. Feed: vinyl chloride monomer. Product: polyvinyl chloride (115,000 mt/y).

CF INDUSTRIES INC.

Donaldsonville, La. Feed: natural gas. Products: ammonia (1,570,000 mt/y), urea (980,000 mt/y).

Terre Haute, Ind. Feed: natural gas. Product: ammonia (130,000 mt/y).

CHAMPLIN REFINING & CHEMICALS, INC.

Corpus Christi, Tex. Feed: crude oil. Products: benzene (150,000 mt/y), cumene (374,000 mt/y), cyclohexane (104,000 mt/y), propylene (136,000 mt/y), toluene (66,000 mt/y).

CHEVRON CHEMICAL CO.

Baytown, Tex. Feed: butadiene. Products: alpha-olefins (113,600 mt/y), ethylene (612,245 mt/y), butadiene (190,000 mt/y), id polyethylene (272,000 mt/y), propylene (424,036 mt/y).

Cedar Bayou, Tex. Feed: LNG, naphtha. Product: propylene (364,000 mt/y).

Finley, Wash. Feed: natural gas. Product: ammonia (122,500 mt/y).

Marietta, Ohio. Feed: styrene. Product: polystyrene (197,000 mt/y).

Orange, Tex. Feed: ethylene. Product: ld polyethylene (134,400 mt/y), hd polyethylene (249,600 mt/y).

Pascagoula, Miss. Feed: petroleum base stocks. Product: paraxylene (218,000 mt/y).

Port Arthur, Tex. Feed: petroleum base stocks. Products: butadiene (66,250 mt/y), ethylene (455,000 mt/y), propylene (205,000 mt/y).

St. Helens, Ore. Feed: natural gas. Products: ammonia (82,855 mt/y), urea (116,000 mt/y).

Philadelphia, Pa., St. James, La. Feed: petroleum base stocks. Products: aromatics mix (550,000 mt/y), cumene (408,000 mt/y), cyclohexane (112,000 mt/y), ethylbenzene (771,000 mt/y), toluene (330,000 mt/y).

CITGO PETROLEUM CORP.

Lake Charles, La. Feed: crude. Product: benzene (134,000 mt/y), propylene (181,000 mt/y).

COASTAL EAGLE POINT OIL CO.

Westville, N.J. Feed: crude oil. Product: cumene (94,000 mt/y).

COASTAL REFINING AND MARKETING INC.

Products: benzene (246,000 mt/y), xylene mix (77,000 mt/y).

COLUMBIA NITROGEN CORP.

Augusta, Ga. Feed: natural gas. Products: ammonia (500,000 mt/y), urea (360,000 mt/y).

COLUMBIAN CHEMICALS CO.

El Dorado, Ark. Feed: heavy aromatic hydrocarbons. Product: carbon black (18,761 mt/y).

North Bend, La. Feed: heavy aromatic hydrocarbons. Product: carbon black (33,178 mt/y).

Marshall, W. Va. Feed: heavy aromatic hydrocarbons. Product: carbon black (26,535 mt/y).

Hickok, Ka. Feed: heavy aromatic hydrocarbons. Product: carbon black (11,935 mt/y).

COMINCO FERTILIZERS.

Borger, Tex. Feed: natural gas. Products: ammonia (368,000 mt/y), urea (71,500 mt/y).

CONCARB DIVISION, WITCO CORP.

Phenix City, Ala. Feed: heavy aromatic oil. Product: carbon black (27,215 mt/y).

Ponca City, Okla. Feed: heavy aromatic oil. Product: carbon black (68,000 mt/y).

Sunray, Tex. Feed: heavy aromatic oil. Product: carbon black (54,000 mt/y).

COPOLYMER RUBBER & CHEMICAL CORP.

Addis, La. Feed: petroleum derivative. Product: ethylene-propylene rubber (40,000 mt/y).

Baton Rouge, La. Feed: petroleum derivatives. Products: styrene-butadiene rubber (190,000 mt/y).

CROWN CENTRAL PETROLEUM

Houston, Tex. Feed: crude oil. Product: propylene (90,800 mt/y).

DEGUSSA.

Arensas Pass, Tex. Product: carbon black (50,000 mt/y).

Belpre, Ohio. Product: carbon black (55,000 mt/y).

Ivanhoe, La. Product: carbon black (100,000 mt/y).

DIAMOND SHAMROCK REFINING & MARKETING CO.-Mont Belvieu, Tex. Feed: propylene. Product: propylene (272,000 mt/y).

DIXIE CHEMICAL CO.

Bayport, Tex. Feed: acrylic monomers. Product: acrylics (5,000 mt/y).

DOW CHEMICAL

Freeport, Tex. Products: acetylene (4,000 mt/y), acrylonitrile-butadiene-styrene (136,000 mt/y), ammonia (47,000 mt/y), benzene (535,000 mt/y), bisphenol A (77,000 mt/y), ethylbenzene (795,000 mt/y), ethylene (1,820,000 mt/y), ethyl chloride (35,000 mt/y), ethylene dichloride (727,000 mt/y),

ethylene glycol (115,000 mt/y), ethylene oxide (130,000 mt/y), phenol (211,000 mt/y), hd polyethylene (75,000 mt/y), ld polyethylene (400,000 mt/y), propylene (250,000 mt/y), propylene glycol (114,000 mt/y), propylene oxide (435,000 mt/y), styrene (590,000 mt/y).

Ironton, Ohio. Products: acrylonitrile (29,000 mt/y), polystyrene.

Oyster Creek (Freeport), Tex. Products: acetone (127,000 mt/y), ethylene dichloride (500,000 mt/y), vinyl chloride (350,000 mt/y).

Plaquemine, La. Products: ethylene (582,000 mt/y), ethylene dichloride (900,000 mt/y), ethylene glycol (204,000 mt/y), ethylene oxide (206,000 mt/y), hd polyethylene (120,000 mt/y), ld polyethylene (350,000 mt/y), propylene (75,000 mt/y), propylene glycol (68,000 mt/y), propylene oxide (200,000 mt/y), plasticizers (54,000 mt/y).

Torrance, Calif. Products: acrylonitrile (34,000 mt/y), polystyrene (453,000 mt/y).

DSM CHEMICALS NORTH AMERICA, INC.

Augusta, Ga. Feed: cyclohexane. Product: caprolactam (140,000 mt/y).

DYNAGEN INC.

(A General Tire sub.)

Odessa, Tex. Feed: butadiene, styrene. Product: SBR (95,000 mt/y).

ETHYL CORP.

Orangeburg, S.C. Feed: ethylene. Product: alkylbenzene.

Pasadena, Tex. Feed: ethylene. Products: alphaolefins, ethylchloride, ethylene dichloride.

EXXON CHEMICAL AMERICAS

Baton Rouge, La. Feed: petroleum intermediates. Products: benzene, butadiene, butylenes, carbon black feedstocks, ethylene, ethylene vinyl acetate copolymers, heart cut distillates, higher olefins, isoparaffins, isoprene, isopropanol, oxoalcohols, phthalic anhydride, ld polyethylene, propylene, vinyl acetate, plasticizers, resins, butyl rubber, chlorobutyl, ep rubber, solvents.

Baytown, Tex. Feed: petroleum intermediates. Products: benzene, butadiene, butene 1, ethylene, isomylene, isobutylene, MTBE, orthoxylene, paraffins, paraxylene, polybutene polymers, polypropylene, polyisobutylene, propylene, butyl rubber.

Bayway, N.J. Feed: petroleum intermediates. Products: polyisobutylene, propylene, solvents.

Mont Belvieu, Tex. Products: linear ld polyethylene, hd polyethylene.

FARMLAND INDUSTRIES INC.

Beatrice, Neb. Feed: natural gas. Product: ammonia (590 mt/d).

Dodge City, Kan. Feed: natural gas. Product: ammonia (590 mt/d).

Enid, Okla. Feed: natural gas. Products: ammonia (2,280 mt/d), urea (900 mt/d).

Fort Dodge, Iowa. Feed: natural gas. Product: ammonia (570 mt/d).

Lawrence, Kan. Feed: natural gas. Product: ammonia (1,040 mt/d), urea (680 mt/d).

Pollock, La. Feed: natural gas. Product: ammonia (1,140 mt/d).

FINA OIL & CHEMICAL CO.

Big Spring, Tex. Feed: crude oil. Products: benzene (25,000 mt/y), propylene (30,000 mt/y).

Calumet City, Ill. Feed: styrene. Product: polystyrene (90,718 mt/y).

Carville, La. Feed: benzene, ethylene. Products: polystyrene (155,000 mt/y), styrene (340,300 mt/y).

LaPorte, Tex. Feed: ethylene, propylene. Product: polypropylene (408,234 mt/y).

Port Arthur, Tex. Feed: crude oil. Products: benzene (171,000 mt/y), propylene (55,000 mt/y), xylene mix (295,000 mt/y).

FIRESTONE SYNTHETIC RUBBER & LATEX CO.-Lake Charles, La.

Feed: butadiene, styrene. Product: SBR (120,000 mt/y).

Orange, Tex. Feed: duradene. Product: polybutadiene (110,000 mt/y).

GENCORP POLYMER PRODUCTS.

Mogadore, Ohio. Feed: butadiene, styrene. Product: SBR (90,000 mt/y).

GEORGIA GULF CORP.

Delaware City, Del. Feed: vinyl chloride. Product: polyvinyl chloride (24,000 mt/y), polyvinyl chloride compound (47,500 mt/y).

Pasadena, Tex. Feed: benzene, propylene. Product: acetone (50,000 mt/y), cumene (635,036 mt/y), phenol (80,000 mt/y).

Plaquemine, La. Feed: ethylene, natural gas, benzene. Products: acetone (168,000 mt/y), ammonia (190,000 mt/y), cumene (644,000 mt/y), methanol (442,000 mt/y), phenol (272,000 mt/y), polyvinyl chloride (390,000 mt/y), vinyl chloride (572,000 mt/y).

GEORGIA-PACIFIC CORP.

Albany, Oregon. Feed: methanol. Product: formaldehyde (81,647 mt/y).

Columbus, Ohio. Feed: methanol. Product: formaldehyde (106,595 mt/y).

Conway, N.C. Feed: methanol. Product: formaldehyde (65,771 mt/y).

Crossett, Ark. Feed: methanol. Product: formaldehyde (81,647 mt/y).

Lufkin, Tex. Feed: methanol. Product: formaldehyde (65,772 mt/y).

Hampton, S.C. Feed: methanol. Product: formaldehyde (22,680 mt/y).

Russellville, S.C. Feed: methanol. Product: formaldehyde (131,543 mt/y).

Taylorsville, Miss. Feed: methanol. Product: formaldehyde (140,615 mt/y).

Vienna, Ga. Feed: methanol. Product: formaldehyde (56,700 mt/y).

BFGOODRICH CO. GEON VINYL DIVISION

Avon Lake, Ohio, Calvert City and Louisville, Ky., Deer Park and LaPorte, Tex., Henry, Ill., Long Beach, Calif., Padricktown, N.J., Plaquemine, La., Terre Haute, Ind. Products: vinyl chloride monomer and vinyl resins.

GOODYEAR TIRE & RUBBER CO.

Beaumont, Tex. Feed: C-5 streams, butadiene. Products: isoprene (81,600 mt/y), polyisoprene (60,000 mt/y), polybutadiene (182,000 mt/y).

Calhoun, Ga. Feed: butadiene, styrene. Product: SBR (41,000 mt/y).

Houston, Tex. Feed: acrylonitrile, butadiene-styrene. Products: acrylonitrile-butadiene rubber (14,000 mt/y), styrene-butadiene rubber (310,000 mt/y).

Niagara Falls, N.Y. Feed: vinyl chloride monomer. Product: polyvinyl chloride (54,000 mt/y).

Point Pleasant, W. Va. Feed: tps, ethylene glycol. Product: polyester (154,000 mt/y).

W.R. GRACE & CO.

Memphis, Tenn. Feed: natural gas. Products: ammonia (308,400 mt/y), urea (349,300 mt/y).

GREEN VALLEY CHEMICAL CORP.

Creston, Iowa. Feed: natural gas. Product: ammonia (100 mt/d).

HAWKEYE CHEMICAL CO.

Clinton, Iowa. Feed: natural gas and hydrogen. Products: ammonia (200,000 mt/y), urea (60,000 mt/y).

HERCULES INC.

Louisiana, Mo. Feed: natural gas. Product: formaldehyde (80,000 mt/y).

HILL PETROLEUM CO.

Houston, Tex. Feed: crude and intermediate feedstocks. Products: benzene (14,000 mt/y), ethylbenzene (29,000 mt/y), MTBE (61,000 mt/y), normal paraffins (26,000 mt/y), propylene (163,000 mt/y), toluene (48,000 mt/y), xylene mix (53,000 mt/y).

Texas City, Tex. Feed: crude. Product: propylene (86,000 mt/y).

HIMONT USA INC.

Bayport, Tex. Feed: propylene. Product: polypropylene (380,000 mt/y).

Lake Charles, La. Feed: propylene. Product: polypropylene (380,000 mt/y).

HOECHST CELANESE CORP.

Bay City, Tex. Feed: ethylene, propylene. Product: butanol (125,000 mt/y), vinyl acetate (260,000 mt/y).

Bayport, Tex. Feed: benzene, ethylene. Product: high molecular weight hd polyethylene (150,000 mt/y).

Bishop, Tex. Feed: natural gas. Products: formaldehyde (818,000 mt/y), methanol (500,000 mt/y).

Clear Lake, Tex. Feed: natural gas, ethylene. Products: acetic acid (530,000 mt/y), acrylic acid-esters (170,000 mt/y), ethylene glycol (230,000), ethylene oxide (250,000 mt/y), vinyl acetate (230,000 mt/y).

Newark, N.J. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Pampa, Tex. Feed: butane. Products: acetic acid (250,000 mt/y), acetic anhydride (95,000 mt/y).

Rock Hill, S.C. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Spartanburg, S.C. Feed: DMT, TPA, glycol. Products: polyester (200,000 mt/y).

J.M. HUBER CORP.

Baytown, Tex. Feed: refinery bottoms. Product: carbon black (318 mt/d).

Borger, Tex. Feed: refinery bottoms. Product: carbon black (235 mt/d).

Orange, Tex. Feed: refinery bottoms. Product: carbon black (167 mt/d).

HÜLS AMERICA INC.

Chestertown, Md. Feed: alcohols, phthalic anhydride. Product: plasticizers (36,000 mt/y).

IMC FERTILIZER INC.

Sterlington, La. Feed: natural gas. Product: ammonia (900,000 mt/y).

KOPPERS CO.

Bridgeville, Pa. Product: polyester.

Chicago, Ill. Feed: naphthalene, orthoxylene. Products: phthalic anhydride (57,000 mt/y), polyester.

Follansbee, W. Va. Feed: coal tar. Product: naphthalene (70,000 mt/y).

Oxnard, Calif. Product: polyester.

Richmond, Calif. Product: polyester.

LaROCHE INDUSTRIES INC.

Cherokee, Ala. Feed: natural gas. Product: ammonia (175,000 mt/y).

LYONDELL PETROCHEMICAL CO.

Channelview, Tex. Feed: ethane, gas oils, naphthas, mixed C₃s, natural gas, propane. Products: benzene (274,000 mt/y), butadiene (216,000 mt/y), butylenes (209,000 mt/y), ethylene (1,270,000 mt/y), isoprene (41,000 mt/y), methanol (662,000 mt/y), propylene (839,000 mt/y), toluene (100,000 mt/y).

Houston, Tex. Feed: refinery feeds. Products: benzene (184,000 mt/y), orthoxylene (110,000 mt/y), paraxylene (150,000), toluene (100,000 mt/y).

MARATHON OIL CO.

Detroit, Mich. Feed: refinery. Product: propylene (63,500 mt/y).

Garyville, La. Feed: refinery. Product: propylene (60,500 mt/y).

Texas City, Tex. Feed: refinery. Products: aromatics mix (7,600 mt/y), benzene (24,500 mt/y), propylene (62,500 mt/y), toluene (60,500 mt/y), xylene mix (37,700 mt/y).

MELAMINE CHEMICALS INC.

Donaldsonville, La. Feed: urea. Product: melamine (45,000 mt/y).

MISSISSIPPI CHEMICAL CORP.

Yazoo City, Miss. Feed: natural gas. Product: ammonia (1,270 mt/d), urea (490 mt/d).

MOBIL CHEMICAL CO.

(division of Mobil Oil Corp.)

Beaumont, Tex. Feed: natural gas liquids, reformate. Products: benzene (285,000 mt/y), butadiene (27,000 mt/y), butylenes (14,000 mt/y), ethylene (565,000 mt/y), polyethylene (770,000 mt/y),

propylene (145,000 mt/y), toluene (148,000 mt/y).

Chalmette, La. Feed: reformate. Products: benzene (67,000 mt/y), orthoxylene (68,000 mt/y), paraxylene (77,100 mt/y), toluene (171,000 mt/y), xylene mix (13,900 mt/y), solvents (53,200 mt/y).

Houston, Tex. Feed: natural gas liquids. Products: ethylene (245,000 mt/y), propylene (86,200 mt/y).

Holyoke, Mass. Feed: styrene. Products: polystyrene (36,000 mt/y).

Joliet, Ill. Feed: styrene. Product: polystyrene (166,000 mt/y).

Santa Ana, Calif. Feed: styrene. Product: polystyrene (27,000 mt/y).

MONSANTO

Addyston, Ohio; Muscatine, Iowa. Product: ABS (259,000 mt/y).

Alvin, Tex. Feed: propylene. Product: acrylonitrile (210,000 mt/y).

Luling, La. Feed: natural gas. Product: ammonia (210,000 mt/y).

Pensacola, Fla. Feed: butane. Product: maleic anhydride (109,000 mt/y).

NESTE RESINS CORP.

Andalusia, Ala. Feed: methanol. Product: formaldehyde (48,000 mt/y).

Moncure, N.C. Feed: methanol. Product: formaldehyde (50,000 mt/y).

Springfield, Ore. Feed: methanol. Product: formaldehyde (123,000 mt/y).

Winnfield, La. Feed: methanol. Product: formaldehyde (50,000 mt/y).

NIPRO INC.-(N.V. DSM subsidiary)

Augusta, Ga. Feed: cyclohexane. Product: caprolactam (165,000 mt/y).

N-REN CORP.

Carlsbad, N.M. Feed: natural gas. Product: ammonia (70,000 mt/y).

East Dubuque, Ill. Feed: natural gas. Product: ammonia (250,000 mt/y).

Pine Bend, Minn. Feed: natural gas. Product: ammonia (27,000 mt/y).

Pryor, Okla. Feed: natural gas. Product: ammonia (75,000 mt/y).

OCCIDENTAL CHEMICAL CORP.

Addis, La. Feed: vinyl chloride. Product: polyvinyl chloride (225,000 mt/y).

Burlington North, N.J. Feed: vinyl chloride. Product: polyvinyl chloride (55,000 mt/y).

Burlington South, N.J. Feed: vinyl chloride. Product: polyvinyl chloride (55,000 mt/y).

Convent, La. Product: ethylene dichloride (430,000 mt/y).

Deer Park, Tex. Feed: ethylene, chlorine. Products: ethylene dichloride (85,000 mt/y), vinyl chloride (500,000 mt/y).

Pasadena, Tex. Feed: vinyl chloride monomer. Product: polyvinyl chloride (570,000 mt/y).

Pottstown, Pa. Feed: vinyl chloride. Product: polyvinyl chloride (100,000 mt/y).

OKLAHOMA NITROGEN CO.

(62.5% W.R. Grace, 37.5% Terra International)

Woodward, Okla. Feed: natural gas. Products: ammonia (450,000 mt/y), urea (100,000 mt/y).

OLIN CORP.

Lake Charles, La. Feed: natural gas. Products: ammonia (480,000 mt/y), urea (214,000 mt/y).

OXYMAR.

(50% Oxychem)

Corpus Cristi, Tex. Feed: ethylene dichloride. Product: vinyl chloride (635,000 mt/y).

PHILLIPS 66 CO.

Borger, Tex. Feed: crude oil, NGL. Product: cyclohexane (130,000 mt/y).

Pasadena, Tex. Feed: butadiene, ethylene, propylene, styrene. Products: polyisoprene (218,000 mt/y), styrene-butadiene resin (82,000 mt/y).

Sweeny, Tex. Feed: benzene, crude oil, natural gas liquids. Products: benzene (50,000 mt/y), cyclohexane (288,000 mt/y), ethylene (1,089,000 mt/y), propylene (254,000 mt/y), toluene (120,000 mt/y), xylene mix (108,000 mt/y).

POLYSAR INC.

Copley, Ohio. Feed: styrene. Product: polystyrene (70,000 mt/y).

Decatur, Ala. Feed: styrene. Product: polystyrene.

Forest City, N.C. Product: polystyrene (18,000 mt/y).

Laominster, Mass. Feed: styrene. Product: polystyrene (82,000 mt/y).

Orange, Tex. Feed: butadiene, ethylene, propylene. Products: butadiene rubber (88,000 mt/y), edpm (35,000 mt/y).

Springfield, Mass. Feed: styrene. Product: polystyrene.

PPG INDUSTRIES INC.

Lake Charles, La. Feed: ethylene. Products: ethylchloride (68,000 mt/y), ethylene dichloride (665,000 mt/y), vinyl chloride (420,000 mt/y).

QUANTUM CHEMICAL CORP.-USI Division

Clinton, Iowa. Feed: ethane-propane mix. Products: butadiene (17,000 mt/y), ethylene (365,000 mt/y), ld polyethylene (195,500 mt/y), hd polyethylene (159,000 mt/y), propylene (14,000 mt/y).

Chocolate Bayou, Tex. Product: hd polyethylene (181,800 mt/y).

Deer Park, Tex. Feed: LPG. Product: ethylene (750,000 mt/y), polyethylene.

Houston, Tex. Feed: carbon monoxide, ethylene, methanol. Products: acetic acid (363,600 mt/y), ld polyethylene (207,000 mt/y), hd polyethylene (250,000 mt/y), vinyl acetate (272,200 mt/y).

Morris, Ill. Feed: butane, ethane, propane. Products: butadiene (110,000 mt/y), ethylene (455,000 mt/y), ethylene glycol (96,500 mt/y), ethylene oxide (41,000 mt/y), ld polyethylene (245,500 mt/y), polypropylene (120,400 mt/y), propylene (110,000 mt/y).

Port Arthur, Tex. Feed: ethylene. Products: ld polyethylene (136,400 mt/y), ld polyethylene (86,000 mt/y).

Tuscola, Illinois. Feed: ethylene. Products: ethanol (198,000 mt/y), ld polyethylene (77,000 mt/y).

REICHHOLD CHEMICAL INC.

Hampton, S.C. Feed: methanol. Product: formaldehyde.

Houston, Tex. Feed: methanol. Product: formaldehyde.

Kansas City, Kans. Product: formaldehyde.

Tacoma, Wash. Product: formaldehyde.

REXENE PRODUCTS CO.

Bayport, Tex. Feed: ethylene, propylene. Products: ld polyethylene (110,000 mt/y), polypropylene (140,000 mt/y).

Odessa, Tex. Feed: benzene, ethane, propane. Products: ethylene (230,000 mt/y), polyethylene (186,000 mt/y), polypropylene (100,000 mt/y), propylene (100,000 mt/y), styrene (140,000 mt/y).

ROHM AND HAAS CO.

Bayport, Tex; Bristol and Croydon, Pa; Calumet City, Ill; Fayetteville, N.C.; Hayward, Calif; Louisville, Ky. Products: acrylics, acrylic esters, plasticizers, polyester, polyethylene, specialty acrylic monomers and polymers.

Deer Park, Tex. Feed: natural gas, propylene. Products: acrylic acid and esters (280,000 mt/y).

RUBICON INC.

Geismar, La. Feed: benzene. Product: aniline (136,000 mt/y).

SHELL CHEMICAL CO.

Deer Park, Tex. Feed: natural gas liquids, petroleum fractions. Products: acetone (211,000 mt/y), benzene (518,000 mt/y), bisphenol A (159,000 mt/y), butadiene (113,000 mt/y), ethylene (1,365,000 mt/y), isoprene concentrate (45,000 mt/y), isopropanol (272,000 mt/y), phenol (272,000 mt/y), propylene (800,000 mt/y), toluene (100,000 mt/y), xylene mix (198,000 mt/y).

Geismar, La. Feed: ethylene. Products: alphaolefins (560,000 mt/y), ethylene glycol (238,000 mt/y), ethylene oxide (374,000 mt/y), oxoalcohols (272,000 mt/y).

Norco, La. Feed: natural gas liquids, petroleum fractions. Products: butadiene (226,000 mt/y), eth-

ylene (1,160,000 mt/y), polypropylene (154,000 mt/y), propylene (635,000 mt/y).

Taft, Tex. Product: polybutylene (27,000 mt/y).
Wood River, Ill. Product: acetone (164,000 mt/y), benzene (150,000 mt/y), propylene (113,000 mt/y).

SHELL CHEMICAL CO. and UNION CARBIDE CORP.—(Joint ownership)

Seadrift, Tex. Product: polypropylene (91,000 mt/y).

SHINTECH INC.

Freeport, Tex. Feed: vinyl chloride monomer. Product: polyvinyl chloride (680,000 mt/y).

SID RICHARDSON CARBON CO.

Addis, La. Feed: heavy oil and natural gas. Product: carbon black (61,000 mt/y).

Big Spring, Tex. Feed: heavy oil. Product: carbon black (53,000 mt/y).

Borger, Tex. Feed: heavy oil. Product: carbon black (97,000 mt/y).

SIMPLOT & CO., J.R.

Pocatello, Ida. Feed: natural gas. Product: ammonia (275 mt/d).

SOLVAY POLYMERS INC.

(subsidiary of Solvay SA)
Deer Park, Tex. Feed: ethylene, propylene. Product: hd polyethylene (545,000 mt/y), polypropylene (250,000 mt/y).

STEPAN CO.

Joliet, Ill. Feed: orthoxylene. Product: phthalic anhydride (77,168 mt/y).

SUN REFINING & MARKETING CO.

Marcus Hook, Pa. Feed: crude, purchased naphthas. Products: benzene (100,000 mt/y), ethylene (86,000 mt/y), ethylene oxide (44,000 mt/y), propylene (200,000 mt/y), toluene (75,000 mt/y), xylene mix (100,000 mt/y).

Toledo, Ohio. Feed: crude. Products: benzene (60,000 mt/y), toluene (200,000 mt/y), xylene mix (200,000 mt/y).

Tulsa, Okla. Feed: crude. Products: benzene (5,000 mt/y), cyclohexane (100,000 mt/y).

SUNOLIN CHEMICAL CO.

Claymont, Del. Feed: refinery dry gas, oxygen. Products: ethylene (108,863 mt/y), ethylene oxide (45,352 mt/y).

TENNECO OIL CO.

Pasadena, Tex. Feed: natural gas. Product: methanol (407,697 mt/y).

TENNESSEE VALLEY AUTHORITY

Muscle Shoals, Ala. Feed: natural gas. Products: ammonia (200 mt/d), urea (300 mt/d).

TERRA INTERNATIONAL INC.

Sioux City (Port Neal), Iowa. Feed: natural gas. Products: ammonia (720 mt/d), urea (730 mt/d).

Woodward, Okla. Feed: natural gas. Product: ammonia (1,300 mt/d), urea (335 mt/d).

TEXACO CHEMICAL CO.

Delaware City, Del. Feed: petroleum fractions. Products: benzene (50,000 mt/y), naphthalene (27,000 mt/y), toluene (99,000 mt/y).

El Dorado, Kans. Feed: petroleum fractions. Products: acetone (25,000 mt/y), benzene (56,000 mt/y), cumene (64,000 mt/y), phenol (43,000 mt/y), toluene (60,000 mt/y).

Port Arthur, Tex. Feed: ethane, butane, propane, naphthas. Products: aromatics (290,000 mt/y), benzene (200,000 mt/y), butadiene (51,000 mt/y), cyclohexane (220,000 mt/y), ethylene (550,000 mt/y), propylene (317,500 mt/y).

Port Neches, Tex. Feed: NGL. Products: butadiene (272,000 mt/y), ethylene (115,000 mt/y), ethylene glycol (333,000 mt/y), ethylene oxide (409,000 mt/y), propylene (135,000 mt/y).

TEXAS EASTMAN CO.

Harrison County, Tex. Feed: ethane, propane. Products: acetaldehyde (242,000 mt/y), aromatics mix (67,000 mt/y), butanol (100,000 mt/y), buty-

lenes-butadiene mix (50,000 mt/y), butyraldehyde (370,000 mt/y), ethanol (89,000 mt/y), ethylene (650,000 mt/y), ethylene glycol (110,000 mt/y), ethylene oxide (100,000 mt/y), oxoalcohols (250,000 mt/y), ld polyethylene (300,000 mt/y), polypropylene (70,000 mt/y), propylene (300,000 mt/y), solvents (200,000 mt/y).

TEXAS PETROCHEMICALS CORP.

(subsidiary of Texas Olefins Co.)

Houston, Tex. Feed: mixed C₄ olefins, diolefins, isobutane, methanol. Products: butadiene (350,000 mt/y), butene 1 (90,000 mt/y), diisobutylene (30,000 mt/y), isobutylene (25,000 mt/y), MTBE (470,000 mt/y).

TRIAD CHEMICAL CO.

(joint venture Mississippi Chemical and First Mississippi Corp.)

Donaldsonville, La. Feed: natural gas. Products: ammonia (380,000 mt/y), urea (475,000 mt/y).

UNION CARBIDE CORP.

Bound Brook, N.J. Feed: cumene, petroleum derived feedstocks, derivatives. Products: acetone (50,000 mt/y), formaldehyde (45,000 mt/y), phenol (80,000 mt/y), polystyrene.

Seadrift, Tex. Feed: ethane, propane. Products: acetylene (9,000 mt/y), butadiene, ethylbenzene (170,000 mt/y), ethylene (562,300 mt/y), ethylene glycol, ethylene oxide, oxoalcohols, ld polyethylene (227,000 mt/y), ld-hd polyethylene (455,000 mt/y), polypropylene (90,000 mt/y), propylene, styrene (136,000 mt/y), solvents.

Taft, La. Feed: ethane, propane, butane, paraffinate, naphthas. Products: acetic acid, acetylene (5,000 mt/y), acrylic acid and acrylic esters (90,000 mt/y), benzene (230 mt/y), butadiene, ethylene (498,900 mt/y), ethylene dichloride (70,000 mt/y), ethylene glycol, ethylene oxide, ld-hd polyethylene (364,000 mt/y), propylene.

Texas City, Tex. and Ponce, P. R. Feed: butadiene, ethylene, propylene. Products: acetylene (63,000 mt/y), butanol (168,000 mt/y), butyraldehyde (195,000 mt/y), ethanol (339,000 mt/y), ethylene—Ponce (412,700 mt/y), ethylene—Texas City (702,300 mt/y), isopropanol (349,000 mt/y).

UNOCAL CHEMICALS DIVISION

Beaumont, Tex. Feed: reformate. Products: benzene (51,100 mt/y), cyclohexane (50,000 mt/y), toluene (95,800 mt/y), xylene mix (105,900 mt/y).

Brea, Calif. Feed: natural gas. Products: ammonia (227,000 mt/y), urea (109,000 mt/y).

Bridgeview and Lemont, Ill. Product: polymers (62,900 mt/y).

Charlotte, N.C. Product: polymers (133,000 mt/y).

Kenai, Alas. Feed: natural gas. Products: ammonia (1,034,000 mt/y), urea (907,000 mt/y).

La Mirada and Newark, Calif. Product: polymers (73,200 mt/y).

Lemont, Ill. Feed: reformate, primary light oil. Products: benzene (92,000 mt/y), toluene (50,400 mt/y), xylene mix (35,300 mt/y).

UNIROYAL CHEMICAL CO.

Geismar, La. Feed: ethylene, propylene. Product: ethylene-propylene rubber (44,000 mt/y).

VISTA CHEMICAL CO.

Aberdeen, Miss. Feed: vinyl chloride monomer. Product: polyvinyl chloride (206,000 mt/y).

Oklahoma City, Okla. Feed: vinyl chloride. Product: polyvinyl chloride (156,000 mt/y).

Baltimore, Md. Feed: benzene, n-paraffins, chlorine. Products: alkylbenzene (131,000 mt/y).

West Lake, La. Feed: benzene, ethane, kerosene, chlorine. Products: alkylbenzene (91,000 mt/y), aromatics (12,000 mt/y), butadiene (15,000 mt/y), ethylene (317,000 mt/y), n-paraffins (150,000 mt/y), propylene (10,000 mt/y), vinyl chloride (374,000 mt/y).

VULCAN CHEMICALS

Geismar, La. Feed: ethylene. Product: ethylene dichloride (150,000 mt/y).

URUGUAY

ITALCOLOR SA

San José. Feed: methanol. Product: formaldehyde (7,200 mt/y).

VENEZUELA

ESTIZULIA—Estireno del Zulia

(37.5% Pequiven, 37.5% Grupo Zuliano CA, 25% Dow Chemical)

Zulia-EI Tablazo Complex. Feed: styrene. Product: polystyrene (70,000 mt/y).

INTEQUIM—Química Integrada

Valencia. Products: acrylics (1,259 mt/y), alkyls (9,723 mt/y), formaldehyde (7,0680 mt/y), polyamide (160 mt/y), polyester (1,820 mt/y).

NEGROVEN

Valencia. Feed: aromatic oil. Product: carbon black (60,000 mt/y).

NITROVEN—Venezolana del Nitrogeno

(Pequiven, Instituto Fomento Industrial, International Development & Investment Co. Ltd.)

Zulia-EI Tablazo Complex. Feed: natural gas. Products: ammonia (660,000 mt/y), urea (800,000 mt/y).

OXIDOR—Oxidaciones Orgánicas

(59.44% Corimon, 29.13% Corpoquim, 11.3% Pequiven)

Valencia, Edo. Carabobo. Feed: orthoxylene. Product: phthalic anhydride (18,000 mt/y).

PEQUIVEN—Petroquímica de Venezuela

El Paito, Edo. Carabobo. Feed: reformer naphtha. Products: benzene (59,000 mt/y), toluene (18,000 mt/y), xylene (48,000 mt/y).

Morón, Edo. Carabobo. Feed: natural gas. Products: ammonia (200,000 mt/y), urea (248,000 mt/y).

Zulia-EI Tablazo Complex. Feed: ethane, propane. Products: ethylene (170,000 mt/y), propylene (70,000 mt/y).

PETROPLAS—Plásticos Petroquímica

(100% Pequiven)

Zulia-EI Tablazo. Feed: chlorine, ethylene. Products: polyvinyl chloride (40,000 mt/y).

PLASTILAGO—Plásticos del Lago

(49% Pequiven, 31.45% Grupo Zuliano CA, 15% Atochem, 4.55% Mitsui Petrochemical)

Zulia-EI Tablazo. Feed: ethylene. Product: hd polyethylene (80,000 mt/y).

POLILAGO—Polímeros del Lago

(40% Pequiven, 30% Grupo Zuliano CA, 30% Atochem)

Zulia-EI Tablazo Complex. Feed: ethylene. Product: ld polyethylene (63,000 mt/y).

QUÍMICA VENOCO

(Shell 15%, Industrias Venoco 55%, Pequiven 15%, Phillips Investment 15%)

Guacara, Edo. Carabobo. Feed: benzene, propylene. Product: alkylbenzene (56,000 mt/y).

SUPER OCTANOS

José, Edo. Anzoátegui. Feed: methanol, butanes. Product: MTBE (500,000 mt/y).

VIRGIN ISLANDS

ST CROIX PETROCHEMICAL CORP.

(joint venture Amerada Hess Corp. and Hercofin)

St. Croix. Feed: mixed xylenes. Product: paraxylene (275,000 mt/y).

YUGOSLAVIA

DINA P.O. (INA GROUP)

Omislj. Feed: ethylene, EDC. Products: ethylene dichloride (116,000 mt/y), vinyl chloride (150,000 mt/y), ld polyethylene (70,000 mt/y).

DOW CHEMICAL CO.

Zagreb. Product: polystyrene.

JUGOVINIL

Kastel Sucurac. Product: polyvinyl chloride (85,000 mt/y).

COALBED METHANE DRILLING will remain a bright spot in U.S. drilling activity this year. This rig is drilling a water disposal well related to coalbed gas production for Devon Energy Corp. in the San Juan basin.



Politics shaping U.S. oil, gas outlook in 1991

Robert J. Beck
Economics Editor

Politics, more than economics, will shape U.S. and international oil markets this year.

Prices will remain unsettled until the Middle East crisis ends, making projections tenuous.

But economic forces will remain at work. A halt in economic growth coupled with higher prices will reduce U.S. oil demand in 1991.

Demand also fell last year. Warm weather in the first few months of 1990 cut fuel oil consumption. And sharply higher crude and product prices following Iraq's invasion of Kuwait reduced petroleum demand overall during the last 5 months of the year.

This year, U.S. oil production will continue a slide that started in 1986. But at 180,000 b/d, the decline will be smaller than those of recent years, thanks mainly to a production increase in Alaska.

Elevated oil prices will boost rig activity and well completions. The average number of active rigs will exceed levels of the past few years but remain below rates needed to stop the U.S. production slide.

Also stimulating drilling will be growing demand for natural gas.

U.S. production of crude oil and lease condensate fell 333,000 b/d last year. The decline was exaggerated by pipeline and pump station maintenance work that crimped flow from Alaska.

Size of this year's production drop will exceed that of the demand decline, pushing imports up again. U.S. import dependency in 1991 will reach a record 48.1% of consumption.

Price is the wild card this year. A peaceful settlement of the Middle East dispute probably would depress prices once Iraqi and Kuwaiti production returned to the market. If war breaks out, prices will jump and remain

high until the market has a chance to assess extent of the supply disruption. After that, the critical variables will be extent of damage to oil fields, the time required to restore production following a truce, and post-crisis Middle East politics.

Several members of the Organization of Petroleum Exporting Countries increased productive capacity following the Iraqi invasion. Even before the invasion some were planning capacity increases.

When Iraq and Kuwait resume production and exports, therefore, they'll be competing with potential sources of supply that didn't

exist before the invasion. Managing the capacity surplus will test OPEC cohesion and keep politics in the oil market well beyond resolution of the crisis.

Barring war, production will be high enough to depress prices when demand slumps seasonally in the second quarter of the year. Overproduction would raise threats of a serious price slump.

Highlights

Here are highlights of Oil & Gas Journal's review of U.S. market developments in 1990 and forecast for 1991:

- Total energy demand will fall for the second consecutive year in 1991, declining a

FORECAST REVIEW

U.S. energy demand

	1989	1990	% change 1990/89	1991 Trillion BTU	% change 1991/90	% share of market
— Trillion BTU —						
Oil.....	34,211	33,680	- 1.6	33,470	- 0.6	41.4
Natural gas.....	19,362	19,005	- 1.8	19,055	+ 0.3	23.6
Coal.....	18,916	18,930	+ 0.1	18,945	+ 0.1	23.4
Nuclear.....	5,687	6,100	+ 7.3	6,120	+ 0.3	7.6
Hydro & other.....	3,105	3,225	+ 3.9	3,280	+ 1.7	4.0
Total.....	81,281	80,940	- 0.4	80,870	- 0.1	100.0

Source: 1989 EIA; 1990 and 1991 OGI estimate and forecast

U.S. natural gas supply and demand

	1988	1989	1990	% change 1990/89	1991 bcf	% change 1991/90
— bcf —						
Production						
Texas.....	6,286	6,241	6,270	+ 0.5	6,250	- 0.3
Louisiana.....	5,180	5,078	5,180	+ 2.0	5,090	- 1.7
Other states.....	6,375	6,725	6,790	+ 1.0	6,720	- 1.0
Total production....	17,841	18,044	18,240	+ 1.1	18,060	- 1.0
Imports						
Canada.....	1,277	1,340	1,409	+ 5.1	1,465	+ 4.0
Mexico.....	0	0	0	—	0	—
LNG*.....	17	42	71	+69.0	85	+ 19.7
Total imports.....	1,294	1,382	1,480	+ 7.1	1,550	+ 4.7
Supplemental gas.....	101	107	140	+ 0.8	150	+ 7.1
Losses, etc.†.....	- 1,191	- 969	- 1,060	+ 9.4	- 1,050	- 0.9
Total new supply....	18,045	18,564	18,800	+ 1.3	18,710	- 0.5
Supply from storage.....	+ 59	+ 323	- 250	—	- 100	—
Total supply.....	18,104	18,887	18,550	- 1.8	18,610	+ 0.3
Exports.....	74	107	100	- 6.5	100	—
Total consumption	18,030	18,780	18,450	- 1.8	18,510	+ 0.3

*LNG imports from Algeria. †Extraction losses and unaccounted for gas.
Source: 1988 and 1989 EIA; 1990 and 1991 OGI estimate and forecast

marginal 0.1% to 80.87 quadrillion BTU (quads). Petroleum will account for all of the decline.

Consumption of energy from all other sources will post small increases.

- Petroleum product demand will fall 0.6% this year to 16.94 million b/d. This follows a decline of 1.6% in 1990. Before last year, demand had increased for 6 consecutive years.

- Crude and condensate production will drop 2.5% to 7.1 million b/d. Output in 1990 was down 4.4% from the year before at 7.28 million b/d. Production last year was the lowest since 1961.

- Total liquids production, including crude oil, NGL, and other hydrocarbons, will dip 2% in 1991 to 8.7 million b/d. Total liquids production last year was 8.875 million b/d, the lowest level since 1964.

- Total industry imports of crude oil and petroleum products will increase 0.6% in 1991 to 8.14 million b/d. Imports in 1990 were up 1.1% at 8.09 million b/d. The peak import year for the U.S. was 1977, when the average was 8.786 million b/d.

- Strategic Petroleum Reserve (SPR) crude oil stocks are projected to reach 612 million bbl by the end of 1991, an increase of 20 million bbl. SPR stocks increased 12 million bbl in 1990.

- Total input to stills in refineries in the U.S. will slip 0.6% in 1991 to 13.515 million b/d.

Refining capacity will average 15.59 million b/d, up 0.2%. The refinery average utilization rate will fall to 86.7% from 87.3% last year.

- Natural gas consumption will increase 0.3% in 1991 to

18.51 tcf. Consumption last year fell 1.8% to 18.45 tcf. However, domestic production is expected to slip 1% in 1991 to 18.06 tcf. Imports will increase 4.7% to 1.55 tcf. Imports increased 7.1% last year to 1.48 tcf. Imports of LNG will total 85 bcf in 1991.

The economy

Economic growth will stall in 1991. Most economic studies estimate that a recession started in the fourth quarter of 1990 and will extend through at least the first or second quarters of 1991.

OGJ projects that gross national product (GNP) for 1991 will remain at the same level as last year. The recession is expected to be mild. A decline in economic activity in the first half of 1991 will be balanced by renewed growth in the second half.

Last year GNP in 1982 dol-

lars increased by an estimated 1%, compared with 2.5% in 1989. Last year was the eighth consecutive year of economic growth, with the growth rate diminishing the past 2 years.

Industrial production moved up an estimated 1.1% in 1990, and personal consumption expenditures were up 1.1%. Nonresidential investment increased 1.2%. These increases led to the modest increase in GNP in 1990.

This year industrial production and nonresidential fixed investment both will fall by 1%. Housing starts and new car sales are also expected to be down in 1991. This will be partially offset by a 0.5% increase in personal consumption expenditures.

U.S. energy efficiency improved in 1990, extending a long term trend that will continue in 1991, although the gain will be modest.

Energy efficiency in terms of energy consumption per dollar of GNP has been improving steadily since 1970. Lower energy prices slowed the rate of improvement during 1986-88 by reducing incentives for conservation and investments in energy efficiency. Improvements in energy efficiency were posted again in 1989 and 1990 as prices moved up.

In 1990 the U.S. economy used energy at the rate of 19,500 BTU/\$ of GNP. This is down 29.9% from the 27,800 BTU/\$ in 1970. From the base year of 1970 through last year GNP has increased 72.2%, while energy consumption has increased only 20.5%.

Investment in energy efficiency is part of U.S. economic activity. And long term energy efficiency improvements are expected to continue. This year economic activity is expected to be at the same level as last year while energy consumption will drop 0.1% to 80.87 quads. Energy consumption will dip to 19,400 BTU/\$ of GNP.

Energy demand

The drop in total energy demand will all be attributed to a decline in oil energy demand. Oil energy demand

OGJ forecast of U.S. supply and demand

	1991		1990		1989		1988		1987		1986		1985	
	Year	% change	Year	% change	Year	% change	Year	% change	Year	% change	Year	% change	Year	% change
	1991	91/90	1990	90/89	1989	89/88	1988	88/87	1987	87/86	1986	86/85	1985	85/84
1,000 b/d														
	Volume	Change	Volume	Change	Volume	Change	Volume	Change	Volume	Change	Volume	Change	Volume	Change
DOMESTIC DEMAND														
Motor gasoline	7,160	1.0	7,230	-1.3	6,935	-1.5	7,225	-1.0	7,305	-0.8	7,175	-0.6		
Dist. 1-4	5,920	1.1	5,985	-1.4	5,740	-1.7	5,960	-1.1	6,025	-0.8	5,955	-0.6		
Dist. 5	1,240	0.4	1,245	-0.9	1,195	-0.2	1,265	-0.6	1,280	-0.4	1,220	-0.4		
Naphtha jet fuel	185	—	185	-9.8	185	+1.1	185	+1.1	185	+2.8	185	-4.6		
Dist. 1-4	135	0.7	136	-3.5	135	-0.7	135	+1.5	135	+2.3	135	-5.6		
Dist. 5	50	2.0	49	-23.4	50	+6.4	50	—	50	+4.2	50	-2.0		
Kerosine jet fuel	1,315	0.4	1,310	+2.0	1,290	-0.5	1,280	-0.7	1,310	+2.1	1,380	+0.7		
Dist. 1-4	950	0.4	946	+1.1	935	-0.7	930	-0.4	935	+2.5	1,000	+0.4		
Dist. 5	365	0.3	364	+4.6	355	—	350	-1.4	375	+1.1	380	+1.3		
Distillate	3,100	0.3	3,110	-1.5	3,315	+2.6	2,915	-1.8	2,825	-3.3	3,345	+0.8		
Dist. 1-4	2,675	0.4	2,685	-1.7	2,915	+3.0	2,475	-2.2	2,365	-3.5	2,945	+0.6		
Dist. 5	425	—	425	—	400	-0.2	440	+0.7	460	-2.3	400	+2.3		
Residual	1,215	1.6	1,235	-9.9	1,400	+0.3	1,110	-10.3	1,100	-6.2	1,250	+10.3		
Dist. 1-4	970	1.4	989	-10.7	1,135	+0.7	880	-12.5	865	-6.2	1,000	+11.0		
Dist. 5	245	0.4	246	-6.5	265	-1.5	230	-0.9	235	-6.4	250	+7.8		
LPG and ethane	1,575	—	1,575	-5.6	1,650	+1.5	1,410	+1.6	1,450	+0.7	1,790	-3.0		
Dist. 1-4	1,520	—	1,520	-5.9	1,580	+1.6	1,365	+1.6	1,405	+0.6	1,730	-3.1		
Dist. 5	55	—	55	+5.8	70	-1.4	45	+2.3	45	+2.3	60	-1.6		
Other products	2,370	0.2	2,395	+3.5	2,240	-0.4	2,500	-0.3	2,710	-0.3	2,110	+0.2		
Dist. 1-4	2,060	0.1	2,092	+4.8	1,960	-0.5	2,215	-0.6	2,380	-0.2	1,805	-0.1		
Dist. 5	300	1.0	303	-4.1	280	-6.4	285	+1.8	330	-0.9	305	+1.7		
TOTAL DOMESTIC DEMAND	16,940	-0.6	17,040	-1.6	17,015	-0.1	16,625	-1.5	16,885	-1.1	17,235	+0.3		
Dist. 1-4	14,260	0.6	14,353	-1.7	14,400	+0.1	13,960	-1.7	14,110	-1.1	14,570	+1.1		
Dist. 5	2,680	0.3	2,687	-1.4	2,615	-0.9	2,665	-0.2	2,775	-1.0	2,665	+0.1		
EXPORTS	785	-0.6	790	-8.0	800	-0.5	750	-0.3	790	-1.0	800	-0.7		
Dist. 1-4	425	0.5	423	+6.3	410	+7.9	410	+3.3	440	-3.5	440	-4.3		
Dist. 5	360	1.9	367	-20.4	390	-8.0	340	-4.2	350	+2.3	360	+4.0		
TOTAL DEMAND	17,725	-0.6	17,830	-1.9	17,815	-0.1	17,375	-1.4	17,675	-1.1	18,035	+0.2		
Dist. 1-4	14,685	0.6	14,776	-1.5	14,810	+0.3	14,370	-1.6	14,550	-1.2	15,010	—		
Dist. 5	3,040	0.5	3,054	-4.1	3,005	-1.9	3,005	-0.7	3,125	-0.6	3,025	+1.5		
SUPPLY														
Crude & condensate	7,100	2.5	7,280	-4.4	7,210	-3.4	7,140	-1.1	7,060	-1.6	6,990	-3.8		
Dist. 1-4	4,275	9.3	4,515	-4.6	4,350	-6.2	4,300	-5.1	4,250	-5.5	4,200	-4.5		
Dist. 5	2,825	2.2	2,765	-4.0	2,860	+1.3	2,840	+5.5	2,810	+4.9	2,790	-2.7		
NGL and other hydrocar.	1,600	0.3	1,595	-0.7	1,620	+1.1	1,590	+2.4	1,590	-1.2	1,600	-0.9		
Dist. 1-4	1,515	0.4	1,509	—	1,535	+1.2	1,510	+2.9	1,505	-1.2	1,510	-1.1		
Dist. 5	85	1.2	86	-6.5	85	-1.2	80	-4.8	85	-1.2	90	+2.3		
Total domestic production	8,700	2.0	8,875	-3.7	8,830	-2.6	8,730	-0.5	8,650	-1.5	8,590	-3.2		
Dist. 1-4	5,790	3.9	6,024	-3.6	5,885	-4.4	5,810	-3.1	5,755	-4.4	5,710	-3.6		
Dist. 5	2,910	2.1	2,851	-4.1	2,945	+1.2	2,920	+5.2	2,895	+4.7	2,880	-2.5		
IMPORTS														
Crude	6,060	1.3	5,980	+3.3	5,850	-3.1	5,950	-3.2	6,250	-0.3	6,190	+13.2		
Dist. 1-4	5,825	1.4	5,747	+4.1	5,620	-2.2	5,720	-3.5	6,005	-0.7	5,955	+13.1		
Dist. 5	235	0.9	233	-12.7	230	-20.7	230	+2.7	245	+11.9	235	+18.1		
Products and unfinished	2,080	1.4	2,110	-4.8	2,200	-8.2	2,000	-9.0	2,020	+2.9	2,100	+11.5		
Dist. 1-4	2,020	1.2	2,045	-4.3	2,140	-8.4	1,940	-9.2	1,960	+3.6	2,040	+12.3		
Dist. 5	60	7.7	65	-17.7	60	—	60	-3.2	60	-15.5	60	-10.4		
TOTAL IMPORTS	8,140	+0.6	8,090	+1.1	8,050	-4.5	7,950	-4.8	8,270	+0.5	8,290	+12.8		
Dist. 1-4	7,845	0.7	7,792	+1.7	7,760	-4.0	7,660	-5.0	7,965	+0.3	7,995	+12.9		
Dist. 5	295	1.0	298	-13.9	290	-16.9	290	+1.4	305	+5.2	295	+10.9		
Processing gain, loss, etc.	910	4.2	950	+10.2	920	-4.7	860	-3.7	970	-4.4	890	-4.0		
Dist. 1-4	785	4.4	821	+16.1	790	+1.4	750	-7.6	830	-6.1	770	-4.8		
Dist. 5	125	3.1	129	-16.0	130	-30.1	110	+35.8	140	+6.9	120	+1.7		
TOTAL NEW SUPPLY	17,750	-1.0	17,915	-0.9	17,880	-3.6	17,540	-2.6	17,890	-0.8	17,770	+3.6		
Dist. 1-4	14,420	1.5	14,637	-0.2	14,435	-3.9	14,220	-4.4	14,550	-2.0	14,475	+4.8		
Dist. 5	3,330	1.6	3,278	-5.6	3,365	-2.3	3,320	+5.7	3,340	+4.9	3,295	-1.3		
STOCK CHANGE	25	—	85	—	(15)	—	165	—	215	—	(265)	—		
Dist. 1-4	(265)	—	(139)	—	(375)	—	(150)	—	—	—	(535)	—		
Dist. 5	290	—	224	—	360	—	315	—	215	—	270	—		
CRUDE RUNS TO STILL	13,340	-0.6	13,418	+0.1	13,100	-1.4	13,340	-0.3	13,600	-3.9	13,320	+3.6		
TOTAL INPUT TO STILL	13,515	-0.6	13,596	+0.3	13,270	-1.3	13,520	-0.3	13,770	-3.0	13,500	+3.3		
TOTAL REFINING CAPACITY	15,590	+0.2	15,564	-0.9	15,590	+0.3	15,590	+0.5	15,590	-0.1	15,590	—		
REFINING UTILIZATION (%)	86.7	-0.7	87.3	+1.2	85.1	-2.2	86.7	-0.3	88.3	-4.0	86.6	+3.3		
TOTAL INDUSTRY STOCKS†	1,040	+1.0	1,030	+2.9	1,029	-3.0	1,044	-4.8	1,064	-4.2	1,040	-1.0		
Products	700	—	700	+6.1	699	+1.6	704	-1.3	714	-7.0	700	—		
Crude	340	+3.0	330	-3.2	330	-11.8	340	-11.5	350	+2.0	340	+3.0		
SPR stocks	612	-3.4	592	+2.1	597	+2.6	602	+2.6	607	+2.9	612	+3.4		

*Preliminary estimate. †Million bbl at end of period.

Prices

Year	Crude oil		Products		Natural gas	
	Average U.S. wellhead price (\$/bbl)	Average landed cost of imports (\$/bbl)	Unleaded gasoline pump price (\$/gal)	No. 2 fuel oil wholesale price (\$/gal)	Average U.S. wellhead price (\$/Mcf)	Average consumer price (\$/Mcf)
1976	8.19	13.34	61.4	NA	0.58	1.47
1977	8.57	14.31	65.6	NA	0.79	1.78
1978	9.00	14.38	67.0	36.9	0.91	1.98
1979	12.64	21.65	90.3	56.9	1.18	2.34
1980	21.59	33.95	124.5	80.3	1.50	2.91
1981	31.77	36.52	137.8	97.6	1.98	3.51
1982	28.52	33.18	129.6	91.4	2.46	4.32
1983	26.19	28.93	124.1	81.5	2.59	4.82
1984	25.88	28.46	121.2	82.1	2.66	4.85
1985	24.09	26.66	120.2	77.6	2.51	4.72
1986	12.51	13.49	92.7	48.6	1.94	4.13
1987	15.40	17.65	94.8	52.7	1.67	4.05
1988	12.58	14.08	94.6	47.3	1.69	4.09
1989	15.85	17.68	102.1	56.5	1.69	4.22
1990*	19.75	22.00	114.0	67.0	1.69	4.20

*Estimated.
Source: 1976-89 EIA; 1990 OGJ estimates

U.S. energy efficiency

Year	GNP (Billion 1982 \$)	Energy consumption (Trillion BTU)	Energy consumption per GNP 1982 \$ (MBTU)	Oil energy consumption (Trillion BTU)	Oil energy consumption per GNP 1982 dollar (MBTU)
1970	2,416	67,143	27.8	29,537	12.2
1971	2,485	68,346	27.5	30,570	12.3
1972	2,609	71,643	27.5	32,966	12.6
1973	2,744	74,282	27.1	34,840	12.7
1974	2,729	72,543	26.6	33,455	12.3
1975	2,695	70,545	26.2	32,731	12.1
1976	2,827	74,382	26.3	35,175	12.4
1977	2,959	76,289	25.8	37,122	12.5
1978	3,115	78,089	25.1	37,965	12.2
1979	3,192	78,897	24.7	37,123	11.6
1980	3,187	75,955	23.8	34,202	10.7
1981	3,249	73,991	22.8	31,931	9.8
1982	3,166	70,845	22.4	30,231	9.5
1983	3,279	70,524	21.5	30,054	9.2
1984	3,501	74,101	21.2	31,051	8.9
1985	3,619	73,945	20.4	30,922	8.5
1986	3,718	74,237	20.0	32,196	8.7
1987	3,845	76,845	20.0	32,865	8.5
1988	4,017	80,202	20.0	34,228	8.5
1989	4,118	81,281	19.7	34,211	8.3
1990*	4,160	80,940	19.5	33,680	8.1
1991†	4,160	80,870	19.4	33,470	8.0

*Estimated. †Forecast.
Source: 1970-89 EIA; 1990 and 1991 OGJ estimate and forecast

will fall 0.6% in 1991 to 33.47 quads. This will be the third consecutive year of decline in consumption of oil energy. Last year it fell 1.6% to 33.68 quads. Oil energy consumption moved up from 30.054 quads in 1983 to 34.228 quads in 1988.

Oil's energy market share will slip to 41.4% from 41.6% in 1990. After falling from 48.7% in 1977 to 41.8% in 1985, the oil market share moved up when oil prices fell and demand rose, increasing to 43.4% in 1986. Market share slipped to 42.7% in 1988 and 42.1% in 1989.

Demand for energy from natural gas this year will in-

crease 0.3% to 19.055 quads. This follows a decline of 1.8% in 1990 to 19.005 quads. Gas energy market share will move up to 23.6% from 23.5% last year. Market share was 23.8% in 1989 and 23.1% in 1988.

Natural gas is expected to make some headway in the electric utility sector in the next few years. Hydroelectric output will increase, but nuclear growth will stall. Coal consumption will continue to increase with growing demand for electric power, but the rate of growth will slow due to environmental concerns and costs.

Coal energy consumption

is projected to move up only 0.1% this year to 18.945 quads. Demand last year also increased 0.1% at 18.93 quads. Market share will remain at 23.4% in 1991. The market share was 23.3% in 1989 and 23.5% in 1988. During the last several years coal and natural gas have been competing for second place as a fuel source.

Energy from nuclear power is expected to move up only 0.3% in 1991 to 6.12 quads. It increased 7.3% last year following marginal growth in 1989. Nuclear's share of the energy market will rise to 7.6% in 1991 from 7.5% in 1990. Its market share fell in

1989 to 7%. Energy from nuclear power is approaching its expected peak. The last new facilities are expected to come on line this year, but some of the increase in power generated will be offset by decreases in efficiency of older plants.

Energy from hydro and geothermal power is projected to increase 1.7% this year to 3.28 quads. This follows a 3.9% increase in 1990 to 3.225 quads. Market share will remain at 4% in 1991, up from 3.8% in 1989 and 3.6% in 1988. The level of hydroelectric output is still recovering from drought in the West the last several years.

Oil supply, production

Crude and condensate production this year will fall to its lowest level since 1960.

The recent production high point came in 1985 at an average of 8.971 million b/d. Since then oil price slumps and environmental restrictions have depressed drilling, and North Slope output has begun to decline.

OGJ's production projection for this year will represent a 20.9% slide since the 1985 peak.

And drilling shows no sign of improving enough to offset the production decline. The Baker Hughes Inc. active rig count moved up 16.2% in 1990 to an average of 1,010 active rigs. This was up from a modern record low of only 869 rigs in 1989. And during the previous 2 years the count averaged only 936 active rigs.

OGJ's projection for total liquids production this year—8.7 million b/d—represents an 18.2% decline from the recent high of 10.636 million b/d in 1985 and the lowest level since 1963.

Production of NGL and other hydrocarbons not included in the crude and condensate numbers fell 0.7% in 1990 to 1.595 million b/d. Output is expected to move up slightly in 1991 to 1.6 million b/d.

Alaskan production for 1990 is estimated at 1.79 million b/d, down 84,000 b/d from 1989 and down 227,000 b/d from the peak of 2.017 million b/d in 1988.

U.S. production of crude oil and lease condensate

	*1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	Cumulative 1959-1990 1,000 bbl
	1,000 b/d										
District 1:											
Fla., N.Y., Pa., W. Va.....	30	35	38	41	47	57	63	77	93	117	2,650,673
Total Dist. 1	30	35	38	41	47	57	63	77	93	117	2,650,673
District 2:											
Illinois.....	56	56	61	66	75	83	79	80	76	66	3,400,166
Indiana.....	8	9	10	10	13	14	15	15	15	13	518,428
Kansas.....	149	152	161	164	184	207	207	196	193	181	5,703,868
Kentucky.....	14	15	15	16	18	21	21	22	20	18	723,472
Michigan.....	58	59	64	71	70	75	83	87	86	89	1,106,881
Nebraska.....	16	17	16	17	19	19	18	17	19	18	447,749
North Dakota.....	101	101	107	113	125	139	144	139	129	124	1,042,259
Ohio.....	26	28	32	33	37	41	42	41	40	37	999,218
Oklahoma.....	302	322	352	368	409	446	460	435	435	422	13,334,066
Others†.....	9	6	7	7	6	7	8	7	7	7	42,317
Total Dist. 2	736	765	825	865	956	1,052	1,077	1,039	1,020	975	27,318,424
District 3:											
Alabama.....	51	54	57	56	58	59	54	51	55	57	443,676
Arkansas.....	28	31	37	39	43	52	51	52	52	50	1,650,989
Louisiana.....	1,029	1,109	1,217	1,320	1,404	1,393	1,408	1,314	1,256	1,231	21,475,107
Mississippi.....	74	75	75	77	82	84	90	86	91	94	2,013,139
New Mexico.....	183	188	195	198	207	215	216	206	195	196	4,281,141
Texas.....	1,890	1,960	2,062	2,137	2,300	2,435	2,472	2,473	2,535	2,589	53,333,620
Total Dist. 3	3,255	3,417	3,643	3,827	4,094	4,239	4,291	4,182	4,184	4,217	83,197,672
District 4:											
Colorado.....	81	84	88	79	80	83	79	80	84	83	1,592,560
Montana.....	53	57	64	69	74	82	81	80	85	84	1,314,108
Utah.....	76	78	90	98	107	112	95	81	61	71	1,020,777
Wyoming.....	284	295	311	315	332	352	339	324	324	358	5,865,904
Total Dist. 4	494	514	553	561	593	629	594	565	554	596	9,793,340
District 5:											
Alaska.....	1,790	1,874	2,017	1,962	1,867	1,826	1,722	1,713	1,696	1,609	9,061,740
California.....	964	998	1,055	1,084	1,115	1,161	1,126	1,109	1,099	1,055	22,737,203
Nevada.....	11	9	9	9	8	8	5	2	2	2	31,005
Others§.....	(s)	(s)	(s)	(s)	(s)	(s)	1	1	1	1	20,600
Total Dist. 5	2,765	2,881	3,081	3,055	2,990	2,995	2,854	2,825	2,796	2,667	31,850,548
U.S. total.....	7,280	7,612	8,140	8,349	8,680	8,971	8,879	8,688	8,649	8,572	154,810,666

(s) Less than 500 b/d.

*Preliminary. †Includes Missouri, South Dakota, and Tennessee. §Includes Arizona and Washington.

Supply and demand for crude in the U.S.

	*1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
	1,000 b/d									
SUPPLY										
Crude imports†.....	6,035	5,843	5,107	4,674	4,178	3,201	3,426	3,330	3,488	4,396
Crude production.....	7,280	7,613	8,140	8,349	8,680	8,971	8,879	8,688	8,649	8,572
Unaccounted for crude.....	250	200	196	145	139	145	185	114	71	53
Total supply.....	13,565	13,656	13,443	13,168	12,997	12,317	12,490	12,132	12,208	13,051
DEMAND										
Crude refinery runs.....	13,418	13,401	13,246	12,854	12,716	12,002	12,044	11,685	11,774	12,470
Crude used directly and loss.....	26	28	40	34	49	61	65	66	62	63
Crude exports.....	118	142	155	151	154	204	181	164	236	228
Crude into SPR.....	33	56	51	73	48	118	195	234	175	336
Total demand.....	13,595	13,627	13,492	13,112	12,967	12,385	12,485	12,149	12,247	13,097
Crude stock change (industry).....	30	29	- 49	56	30	- 68	5	- 17	- 39	- 46
Crude stocks (million bbl)										
Primary (industry)§.....	330	341	330	349	331	320	345	343	350	363
SPR.....	592	580	560	541	512	493	450	379	294	230

*Preliminary. †Includes imports for the Strategic Petroleum Reserve.

§Includes Alaskan crude in transit as of 1980.

Crude imports by country of origin*

	†1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
	1,000 b/d									
Algeria\$	67	60	58	115	78	84	195	176	90	261
Angola	214	279	203	180	102	104	85	71	42	45
Australia	48	31	59	49	30	21	25	0	0	0
Canada	632	630	681	608	570	468	341	274	214	164
China	67	76	82	63	68	36	15	6	8	0
Colombia	121	136	106	115	57	0	0	0	0	0
Congo	28	11	29	16	20	16	33	18	1	3
Ecuador\$	41	80	33	23	64	56	47	56	32	38
Gabon\$	66	49	15	35	25	51	57	59	40	35
Indonesia\$	112	158	186	262	297	292	304	315	226	318
Iran\$	0	0	0	98	19	27	10	48	35	0
Iraq\$	509	441	343	82	81	46	12	10	3	0
Kuwait\$	75	155	80	70	28	4	24	7	2	0
Libya\$	0	0	0	0	0	0	0	0	23	317
Malaysia	56	39	19	12	11	1	0	3	18	33
Mexico	718	716	674	602	621	715	659	766	645	469
Nigeria\$	834	800	607	529	437	280	207	301	510	611
Norway	147	127	62	70	53	31	112	65	102	114
Oman	45	18	7	35	8	2	10	34	22	24
Saudi Arabia\$	1,204	1,116	902	642	618	132	309	321	530	1,112
Trinidad & Tobago	76	73	71	75	93	98	87	83	92	102
United Arab Emirates\$	9	21	23	56	38	35	90	18	81	77
United Kingdom	178	160	254	304	317	278	378	365	441	369
Venezuela\$	675	495	439	488	416	306	253	164	155	147
Zaire	35	26	31	22	26	34	31	22	19	16
Others	114	147	142	123	102	85	141	146	158	140
Total imports	6,035	5,843	5,107	4,674	4,178	3,201	3,426	3,329	3,488	4,396
Total from OPEC	3,600	3,374	2,686	2,400	2,113	1,320	1,512	1,477	1,696	2,922

*Includes imports for the Strategic Petroleum Reserve. †Preliminary. §OPEC member.

Imports of refined products

	†1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
	1,000 b/d									
Gasoline	141	369	405	384	326	381	299	247	197	157
Kerosine	4	7	16	17	13	8	12	11	13	7
Jet fuel-kerosine	101	102	87	64	48	30	47	29	23	31
Jet fuel-naphtha	0	3	3	3	9	9	14	1	5	7
Distillate	246	306	302	255	247	200	272	174	93	173
Residual	384	629	644	565	669	510	682	699	776	800
Unfinished oils	401	348	360	299	250	318	231	234	174	112
Other†	490	454	479	417	483	411	459	327	344	312
Total U.S.	2,110	2,218	2,295	2,004	2,045	1,866	2,016	1,722	1,625	1,599

*Preliminary. †Includes plant condensate.

Exports of refined products and crude

	†1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
	1,000 b/d									
Gasoline	54	39	22	35	33	10	6	10	20	2
Distillate	62	97	69	66	100	67	51	64	74	5
Residual	214	215	200	186	147	197	191	185	209	118
Lubricants	20	19	26	23	23	15	15	16	16	19
Coke	210	235	231	213	238	187	194	195	156	138
Asphalt and road oil	2	3	1	1	1	0	1	1	1	—
LPG	40	35	49	38	42	62	48	73	65	42
Other refined products	70	76	63	51	47	38	36	31	38	43
Total refined products	672	717	660	613	631	577	542	575	579	367
Crude	118	142	155	151	154	204	181	164	236	228
Total exports	790	859	815	764	785	781	723	739	815	595

*Preliminary.

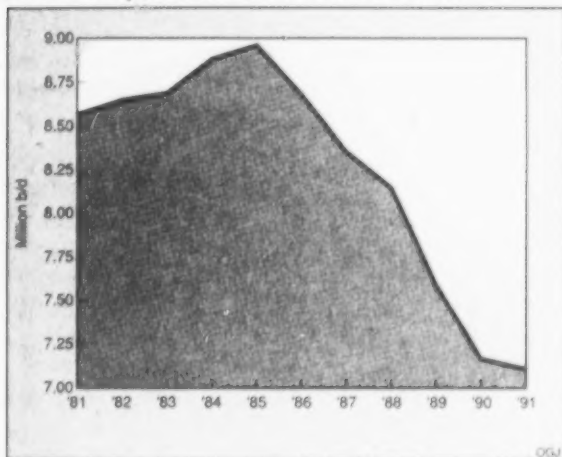
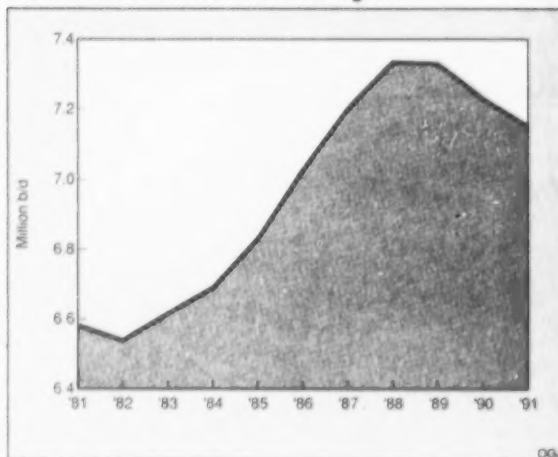
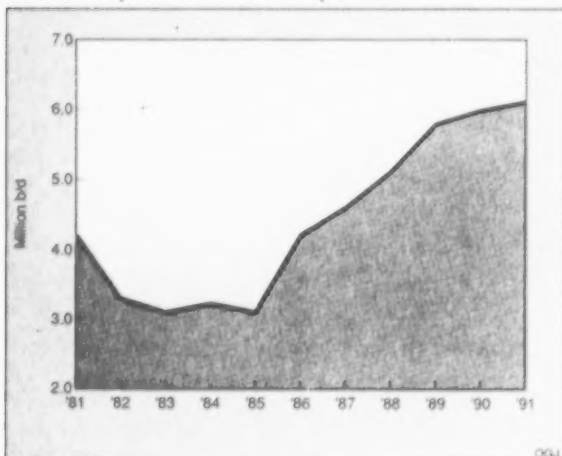
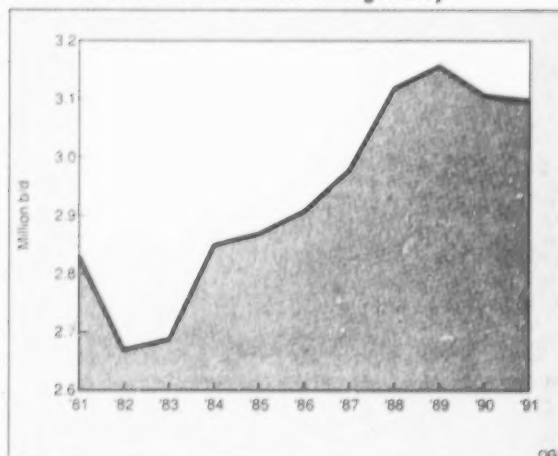
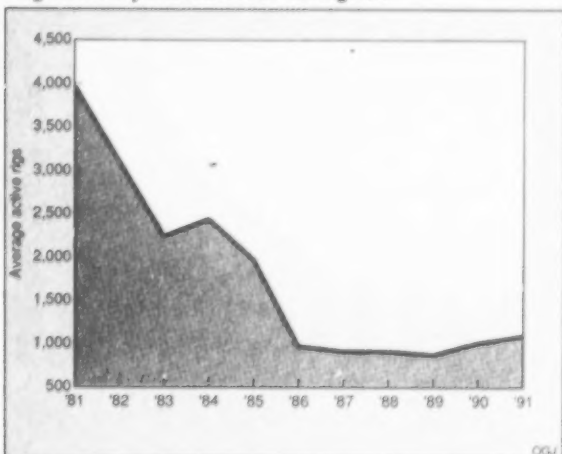
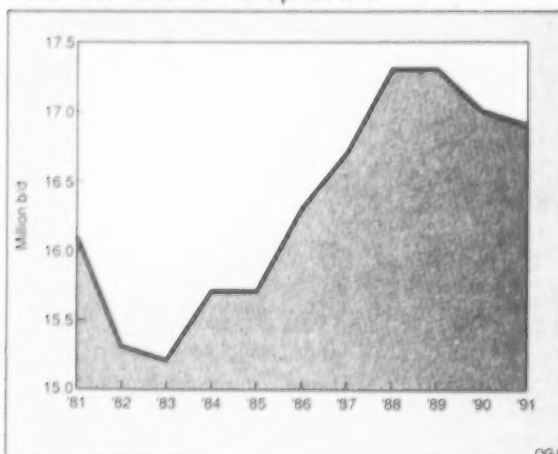
This year, Alaskan production is expected to rise 3.4% to 1.85 million b/d, reflecting completion of the pipeline maintenance projects that restricted output last year.

Lower 48 production aver-

aged 5.49 million b/d in 1990, compared with 5.739 million b/d in 1989. Output in the Lower 48 is expected to fall another 240,000 b/d in 1991 to average 5.25 million b/d. At the end of the drilling

boom in 1984, Lower 48 output was 7.157 million b/d. Output last year was down 23.3% from that recent high. Declines among key producing states in 1990 included Texas 70,000 b/d to 1.89

million b/d, Louisiana 80,000 b/d to 1.029 million b/d, California 34,000 b/d to 964,000 b/d, Oklahoma 20,000 b/d to 302,000 b/d, and Wyoming 11,000 b/d to 284,000 b/d.

Crude output will continue to decline**Gasoline demand will fall again****Crude imports continue upward****Distillate demand down marginally****Rig activity will increase again****Total demand will drop further**

Rotary rig activity by states

	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
Alabama	25.9	11.4	12.0	10.6	10.3	22.3	15.5	16.4	15.4	17.3
Alaska	11.7	10.9	12.1	8.5	12.6	20.0	14.0	13.8	21.6	23.5
Arizona	0.1	0.0	0.0	0.2	0.0	0.2	0.2	0.3	1.0	1.1
Arkansas	11.4	8.7	8.4	9.1	9.6	24.0	26.3	25.9	27.0	33.9
California	49.1	48.5	60.0	60.9	49.1	80.0	106.8	105.9	128.7	154.9
Land	45.1	42.8	52.9	54.6	43.8	68.3	88.8	83.7	106.2	133.7
Offshore	4.0	5.7	7.1	6.3	5.3	11.7	18.0	22.3	22.6	21.1
Colorado	30.2	6.9	28.7	24.8	24.3	49.8	53.9	52.3	60.3	81.6
Florida	2.0	1.8	1.4	2.8	2.2	6.7	3.7	4.4	4.6	7.8
Idaho	0.0	0.0	1.0	0.4	1.0	1.3	0.8	1.2	1.5	3.2
Illinois	4.0	4.8	3.9	3.4	5.6	28.4	41.5	60.5	75.5	44.6
Indiana	0.0	0.1	0.0	0.5	1.2	3.6	6.4	5.9	7.1	1.2
Kansas	46.8	42.6	40.0	48.5	46.8	91.4	127.1	124.5	157.4	196.2
Kentucky	7.8	5.3	5.1	2.0	2.5	6.3	7.9	8.3	9.5	5.3
Louisiana	135.9	139.5	163.2	134.7	142.1	282.2	309.9	282.3	342.8	455.6
North	18.5	16.1	13.9	11.4	11.3	24.5	30.1	29.6	39.6	58.0
Inland waters	20.9	17.1	25.0	22.9	41.8	85.4	96.1	81.6	107.8	83.2
South	40.0	34.7	36.7	35.4	20.2	43.4	51.2	47.3	59.2	160.3
Offshore	75.4	71.7	87.6	64.9	68.8	129.0	132.5	123.8	136.3	154.1
Michigan	12.7	16.8	19.5	21.8	24.0	33.5	34.0	29.2	31.4	36.5
Mississippi	12.8	16.7	17.5	13.1	15.3	30.8	32.0	32.8	41.6	71.5
Montana	8.0	5.3	7.8	8.5	9.7	22.7	36.0	23.8	36.2	81.4
Nebraska	2.2	1.3	2.9	5.2	3.1	6.4	8.9	9.0	9.4	15.1
Nevada	1.0	2.4	1.8	1.5	2.9	4.9	4.8	1.1	3.0	4.9
New Mexico	36.7	35.9	36.9	34.6	29.0	71.1	78.0	65.3	103.3	134.9
New York	1.7	0.5	1.1	2.0	2.2	4.8	8.8	10.3	15.2	11.6
North Dakota	19.0	14.6	14.5	14.1	13.3	38.3	50.9	42.3	69.4	118.8
Ohio	12.4	12.9	13.8	19.6	17.5	28.8	51.0	39.7	56.8	97.8
Oklahoma	129.8	121.8	125.3	136.1	141.2	251.3	319.1	285.4	621.5	698.4
Pennsylvania	15.5	17.3	18.7	17.4	17.9	29.5	35.2	22.1	32.6	38.6
South Dakota	0.0	0.8	0.7	0.4	0.6	1.7	2.1	1.0	1.5	2.2
Texas	348.4	263.4	280.3	293.0	310.9	676.6	849.5	797.0	989.5	1,315.8
Gulf Coast	36.7	38.2	36.8	42.4	44.5	101.3	137.9	134.3	168.4	305.0
Offshore & inland waters	22.9	22.8	25.4	19.8	21.7	51.5	59.8	56.3	88.4	74.4
North	26.9	23.6	28.5	23.8	36.5	86.9	124.4	125.0	138.1	170.6
Panhandle	10.4	11.2	15.1	16.8	16.0	37.2	49.6	48.4	66.2	66.5
East	4.5	50.6	37.6	36.2	45.4	77.2	101.8	102.2	116.5	163.7
West Central	150.3	43.0	43.9	44.8	41.7	81.8	99.7	102.6	150.4	191.4
West	94.3	74.1	93.0	109.3	105.1	240.7	276.4	228.2	272.5	344.3
Utah	5.2	5.3	6.1	7.4	11.1	28.5	45.5	36.7	39.8	69.2
West Virginia	16.2	15.9	12.6	12.6	15.0	26.1	37.9	34.2	49.4	44.8
Wyoming	37.1	33.5	36.8	39.3	35.4	92.1	114.5	95.8	142.7	191.3
Others	4.3	3.7	4.4	3.1	6.9	4.9	5.2	4.5	6.7	9.1
Total U.S.	1,010.1	868.6	936.3	935.9	963.5	1,968.5	2,428.3	2,232.3	3,104.9	3,669.5
Land	862.0	745.6	784.4	815.6	843.4	1,716.1	2,147.4	1,975.0	2,789.6	3,628.7
Inland waters	21.4	18.6	28.4	24.1	22.6	47.4	68.1	58.2	71.9	83.2
Offshore	126.7	104.4	123.5	96.2	99.7	205.0	212.8	199.1	243.4	257.6
Canada-land	136.8	126.6	194.4	179.5	174.8	302.1	242.8	189.5	195.0	258.7
Canada-offshore	1.2	1.1	2.5	2.0	4.1	9.1	13.5	10.4	5.4	4.8
Grand total	1,146.8	996.3	1,133.2	1,117.1	1,142.5	2,279.7	2,634.6	2,432.2	3,305.3	4,232.9

Source: Baker Hughes Inc. Note: May not add due to independent rounding.

Marketed natural gas production*

	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
	MMcfd									
Alabama	352	352	354	321	294	294	278	249	205	217
Alaska	1,066	1,079	1,035	986	835	880	792	758	698	664
Arkansas	431	461	455	387	359	425	370	349	253	260
California	942	994	1,092	1,163	1,266	1,346	1,305	1,137	1,001	1,009
Colorado	592	594	523	451	448	488	474	448	576	527
Kansas	1,467	1,609	1,575	1,252	1,276	1,405	1,277	1,191	1,177	1,754
Louisiana	14,239	13,913	14,154	14,034	13,412	13,736	15,959	14,609	16,798	18,557
Michigan	451	427	399	403	349	361	395	381	419	418
Mississippi	268	281	339	383	386	395	433	414	554	570
New Mexico	2,569	2,341	2,163	2,257	1,925	2,480	2,623	2,453	2,732	3,078
Ohio	450	438	455	456	499	499	510	415	379	387
Oklahoma	5,883	5,987	5,756	5,493	5,253	5,305	5,440	4,739	5,300	5,531
Pennsylvania	475	525	457	447	438	412	454	324	332	335
Texas	17,177	17,100	17,175	16,784	16,854	16,583	16,945	16,270	17,802	19,205
W. Virginia	649	543	478	438	371	397	394	356	416	440
Wyoming	1,850	1,824	1,391	1,364	1,105	1,141	1,416	1,216	1,503	1,503
Others	1,047	915	947	910	932	970	879	779	594	218
Total	49,973	49,437	48,747	47,530	46,002	47,118	49,944	46,088	50,739	54,673
Volume change	536	690	1,217	1,528	(1,115)	(2,826)	3,856	(4,651)	3,935	(777)
Percent change	1.1	1.4	2.6	3.3	-2.4	-5.7	8.4	-9.2	7.2	-1.4
Imports	4,055	3,785	3,535	2,719	2,056	2,602	2,310	2,520	2,556	2,477
Exports	274	293	201	148	168	151	150	150	142	162

*Includes nonhydrocarbon gases. †Preliminary.

Refinery runs by districts

	1990			Crude runs								
	Crude runs* 1,000 b/d	Input to crude stills* 1,000 b/d	% of operable capacity	1989	1988	1987	1986	1985 1,000 b/d	1984	1983	1982	1981
East Coast	1,218	1,234	90.2	1,189	1,198	1,153	1,122	1,061	1,019	960	1,103	1,202
Appalachian Dist. 1	95	96	78.2	98	100	98	101	92	87	77	93	132
Total Dist. 1	1,313	1,330	89.2	1,287	1,298	1,251	1,223	1,153	1,106	1,037	1,196	1,334
Ill., Ind., Ky.†	2,032	2,099	91.1	1,927	1,944	1,929	1,901	1,837	1,842	1,851	1,765	1,857
Minn., Wisc., Dak.	330	329	98.5	312	307	287	294	285	282	253	251	229
Okla., Kan., Mo.	707	717	97.8	665	665	627	627	617	636	642	763	863
Total Dist. 2	3,070	3,110	93.3	2,904	2,916	2,844	2,822	2,739	2,760	2,746	2,779	2,969
Texas:												
Inland	514	521	87.8	508	480	470	472	472	499	474	456	469
Gulf Coast	2,714	2,750	93.3	3,026	3,021	2,909	2,990	2,750	2,780	2,801	2,726	2,829
Louisiana Gulf	3,402	3,434	94.7	2,380	2,261	2,229	2,162	1,972	2,012	1,862	1,941	2,030
N. La., Ark.	170	172	68.7	169	176	164	170	168	177	170	162	163
New Mexico	69	70	91.0	70	69	66	63	60	68	75	77	81
Total Dist. 3	5,869	5,947	83.6	6,153	6,008	5,839	5,857	5,422	5,536	5,382	5,362	5,572
Total Dist. 4	462	468	85.1	458	452	437	431	432	436	420	416	425
Total Dist. 5	2,704	2,740	89.1	2,598	2,573	2,483	2,383	2,256	2,206	2,100	2,021	2,171
Total U.S.	13,418	13,595	87.4	13,401	13,246	12,854	12,715	12,002	12,044	11,685	11,774	12,471

* Preliminary. † Includes Appalachian Dist. 2.

U.S. refined products, natural gas liquids, and crude stocks

	1990	1989	1988	1987	1986	1985	1984	1983	\$1982	1981
	1,000 bbl									
Gasoline	206,390	215,670	230,771	228,514	235,490	225,148	246,307	225,042	247,085	256,425
Motor	204,000	213,441	228,403	226,183	233,057	222,839	243,296	222,434	244,279	253,001
Aviation	2,390	2,229	2,368	2,331	2,433	2,309	3,011	2,608	2,806	3,424
Special naphthas	3,100	3,005	3,487	3,604	3,759	3,909	2,951	3,153	3,474	3,965
Kerosine	4,700	5,139	7,284	8,447	8,379	7,502	11,893	7,861	10,792	11,042
Distillate	703,000	105,700	123,517	134,485	155,097	143,673	161,072	140,263	185,579	191,541
Residual	44,000	43,838	44,621	47,410	47,437	50,381	53,000	48,504	68,229	77,992
Kerosine jet fuel	38,704	34,471	37,723	41,973	42,677	33,825	35,118	32,346	32,001	34,011
Naphtha jet fuel	6,296	6,380	6,901	7,956	7,072	7,502	6,861	6,265	7,189	7,054
Natural gas liquids & LRG	95,000	88,606	103,948	104,119	109,532	81,707	108,446	116,817	114,497	150,170
Unfinished oils	103,000	106,191	99,858	93,185	94,022	106,656	93,506	108,018	105,277	111,348
Other refined products	64,900	51,071	50,058	48,065	46,258	44,258	41,192	42,429	44,023	46,295
Total products stocks	700,000	660,271	707,356	717,806	749,723	704,561	760,346	730,698	818,146	889,843
Crude stocks (ex. SPR)	330,000	341,291	330,359	348,995	331,224	320,892	345,376	343,850	350,044	363,464
Total stocks (ex. SPR)	1,030,000	1,001,562	1,037,717	1,066,803	1,080,947	1,025,453	1,105,722	1,074,548	1,168,190	1,253,307
SPR stocks	592,000	579,857	559,515	540,648	511,565	493,316	450,505	379,069	293,827	230,341
Total stocks (incl. SPR)	1,622,000	1,581,419	1,597,232	1,607,451	1,592,512	1,518,769	1,556,227	1,453,637	1,462,017	1,483,648

* Preliminary. † Includes blending components. ‡ Change in Energy Information Administration reporting basis.

Imports rising

Industry oil import growth rates are slowing. Import increases of 1.1% last year and 0.6% projected for this year compare with 11.3% in 1988 and 8.9% in 1989, when petroleum product demand rose while U.S. production declined sharply.

Last year's import growth slowdown reflects the demand turnaround. That trend will continue this year in conjunction with a production decline smaller than those of recent years.

Import increases last year and this year are crude oil.

Product imports are down

Crude imports, excluding those for SPR, moved up 3.3% last year to 5.98 million b/d. They will rise 1.3% to 6.06 million b/d this year.

With falling demand in 1990, product imports dropped 4.8% to 2.11 million b/d. They are expected to slip again this year to 2.08 million b/d. Lower demand for residual fuel oil is the main reason.

This year's expected import dependency—48.1% of total consumption—compares with an estimated 47.5% in 1990, 46.2% in

1989, 42.5% in 1988, and 31.5% in 1985.

Crude oil imports for SPR will remain at 50,000-55,000 b/d.

Industry crude stocks were 330 million bbl at yearend 1990 and are expected to increase to 340 million bbl at yearend 1991.

Refinery operations

Price volatility hurt refining profitability in 1990.

During the unusually warm early part of the year, product prices fell more rapidly than crude prices, which squeezed refining margins.

During the second quarter, crude prices weakened while product demand and prices remained relatively stable; margins improved.

Primarily due to the Iraqi invasion of Kuwait, crude and product prices jumped after Aug. 2. Margins widened as refiners rapidly adjusted product prices in line with sharply higher crude futures prices.

But physical crude prices more than caught up in following weeks. Margins plummeted in the last quarter of the year as the increase in crude costs far exceeded the

early increase in product prices. Weak product demand in the fourth quarter helped keep product prices from rising to a level comparable to the higher crude prices.

The annual average U.S. wellhead price of crude oil moved up 24.6% to an estimated \$19.75/bbl in 1990. The average landed cost of imported crude moved up 24.4% to \$22/bbl.

Annual average product prices did not move up as sharply as crude oil prices in 1990. The average pump price of unleaded gasoline increased 11.7% to \$1.14/gal for 1990. The average wholesale price of No. 2 fuel oil was up 18.6% at 67¢/gal for the year.

Even though demand was off in 1990, average total refinery crude runs increased 0.1% to 13.418 million b/d. Refining runs remained high as refiners boosted product stocks that had fallen to low levels at the end of 1989.

Product stocks moved up 6.1% to 700 million bbl at yearend 1990. During the previous year product stocks had fallen close to minimum operating levels. Crude stocks fell 3.2% in 1990 to 330 million bbl.

Average refining capacity was down 0.9% in 1990 to 15.564 million b/d. This combined with increased runs to boost the average utilization rate for refineries in the U.S. to 87.3%, up from 85.1% in 1990. The higher utilization rate tends to help margins by lowering the operating cost per unit of production.

Through the first 9 months of 1990 the estimated average refining cash operating margin was \$2.11/bbl, up from \$0.85/bbl the year before. But the crude and product price movements in the futures market indicate that margins were probably negative in the fourth quarter and that the average for the year will be considerably lower than the 9 month figure.

Crude oil stocks will rise 3% to 340 million b/d at yearend 1991. Product stocks will remain at 700 million bbl.

Product demand

Partly offsetting the main forces restraining petroleum products demand this year—elevated prices and economic stagnation—will be an assumed return to normal weather, which will push up fuel oil consumption early in the year.

For the entire year, however, kerosene jet fuel is the only product for which demand is expected to rise. The sharpest drop will be in demand for residual fuel oil, which is sensitive to price competition from other fuels.

Product demand including exports will fall 0.6% in 1991 to 17.725 million b/d. Exports will average 785,000 b/d, also down 0.6%. Estimated total demand for 1990 was 17.83 million b/d,

down 1.9% from the year before. Exports last year were down 8% at 790,000 b/d.

Petroleum product demand peaked in 1978 at 18.847 million b/d after 5 straight years of increase, then slumped to 15.231 million b/d in 1983. It rebounded to 17.325 million b/d in 1989, recapturing 57.9% of the drop.

The amount of oil energy consumed for each dollar of GNP has been falling since 1977, although it has not been a steady decline. The amount of oil consumed in a given year is influenced by prices of other types of energy.

The ratio fell from 12,500 BTU/\$ of GNP in 1977 to 8,100 BTU/\$ of GNP in 1990, a drop of 35.2%. It is projected to slip further to 8,000 BTU/\$ of GNP in 1991.

The gasoline outlook

OGJ expects demand for motor gasoline to fall for the third consecutive year in 1991, dropping another 1% to 7.16 million b/d. The economic slowdown will combine with higher gasoline prices and improved vehicle fuel efficiency to reduce consumption.

This year's demand will be down 2.4% from the recent high of 7.336 million b/d in 1988. The gasoline consumption record was set in 1978 at 7.412 million b/d. Price induced conservation and improvements in vehicle fuel efficiency reduced consumption to 6.539 million b/d in 1983.

Lower prices and economic growth helped gasoline demand rebound during 1984-88. During that period, growth of the vehicle fleet and increased vehicle use more than offset vehicle fuel efficiency gains.

The average distance driven per gallon of motor gasoline has moved up from 13.3 mpg in 1973 to 20.54 mpg in 1989, an improvement of 54.4%. The average fuel consumed per car per year fell from 771 gal in 1973 to only 506 gal in 1989, a drop of 34.4%. The average distance driven per vehicle was 10,256 miles in 1973, which dropped to a low of 9,141 miles in 1980 and has climbed steadily to 10,382 miles in 1989. The number of automobiles registered increased from 121.6 million in 1980 to 144.4 million in 1989.

The gasoline price surge following Iraq's invasion of Kuwait and the fourth quarter economic slowdown suppressed demand last year.

The estimated average pump price for unleaded gasoline rose 11.7% in 1990 to \$1.14/gal. The estimated average price in the fourth quarter was \$1.369/gal, up 34.3% from the same quarter a year earlier.

Jet fuel, distillate

Total jet fuel demand is expected to rise by only 5,000 b/d in 1991 to 1.5 million b/d following a 6,000 b/d in-

crease in 1990. The increase this year will be in demand for kerosene jet fuel for commercial aircraft, which will average 1.315 million b/d.

Last year kerosene jet fuel demand increased 2%. Total available seat-miles flown by U.S. scheduled airlines were up 7% from the year before for the first 11 months of 1990. Domestic seat-miles were up 5.8%, and international seat-miles were up 11%.

Air freight revenue-ton-miles flown for the first 10 months of 1990 were up 2.6% from the year before. Increased fuel demand due to increased miles flown was partially offset by increased aircraft fuel efficiency.

Miles flown are expected to increase in 1991, but the increase will be modest due to economic stagnation. Most of the increase will be offset by improved aircraft fuel efficiency and conservation, where possible. Demand for naphtha jet fuel for military aircraft fell 20,000 b/d in 1990 to 185,000 b/d. It is expected to remain there in 1991.

Demand for distillate will fall 0.3% to 3.1 million b/d in 1991. This follows a 1.5% drop last year. Much of the decrease in demand last year was due to the first quarter's warm weather. A return to normal weather this year will prevent distillate demand from falling in the first quarter despite the recession. The sluggish economic activity will, however, reduce demand for distillate below year ago levels in the second and third quarters.

With the economic slowdown, demand for highway diesel fuel for trucks will decline slightly in 1991. Industrial and railroad demand will also be down slightly. In addition, higher fuel oil prices will encourage conversions to other fuels for residential and commercial heating. These factors will be offset by the increase in consumption assumed to accompany normally cold weather early in the year.

The average wholesale price of No. 2 fuel oil moved up 18.6% to 67¢/gal in 1990 and contributed to the slide in demand. With much higher crude oil prices and increased demand, the price during the first quarter of 1991 is expected to be up considerably from a year earlier.

Resid demand slumps

Demand for residual fuel oil will fall this year by 1.6% to 1.215 million b/d. Last year resid demand fell 9.9% to 1.235 million b/d.

Declines this year and last relate to electric utilities' demand. Most utilities can switch to other fuels when the resid price is too high. In addition, the increase in hydroelectric power genera-

tion reduced the need for the more costly power generated from resid in 1990. This will continue in 1991. Nuclear power output was up substantially in 1990 and will increase again this year.

Demand in commercial and industrial sectors will remain close to 1990 levels. Transportation demand will move up slightly due to shipping activity associated with increased oil imports.

Demand for LPG and ethane won't change much from 1990's level—1.575 million b/d, down 5.6% from 1989. Last year's drop resulted mainly from a decline of about 65,000 b/d in chemical demand. Chemical sector demand is expected to remain close to 1.01 million b/d this year.

Demand for all other products will slip 0.2% this year to 2.39 million b/d, mostly due to the economic slowdown. Last year demand moved up 3.5% to 2.395 million b/d.

Last year's growth mainly reflected demand for asphalt and petrochemical feed-

stocks. Some growth in asphalt demand is expected this year, depending on the extent of the economic turn. This miscellaneous "all other products" category will account for 14.1% of total domestic demand in 1991.

Natural gas

The economic slowdown will offset a boost from more-normal weather to keep natural gas demand from rising much this year.

Colder weather will boost demand in the residential and commercial sectors. But recession will cut demand in the industrial sector.

Electric utility demand will remain at the 1990 level. In this sector higher oil prices will give a competitive advantage to natural gas at the start of the year. But hydroelectric and nuclear output increases will offset the natural gas gains from utility fuel switching.

Demand last year was down 1.8% at an estimated 18.45 tcf primarily because of extremely warm weather in

the first quarter. Residential demand fell 7.1%, and commercial demand was off 2.9%. Electric utility demand also dropped due to the rebound in hydroelectric and nuclear output.

Natural gas consumption is expected to rise in the future. Environmental considerations and domestic availability make gas an attractive fuel source.

Consumption of gas fell from 20.241 tcf in 1979 to 16.221 tcf in 1986 due to price increases and competition from other fuels. Demand in 1991 will be up 2.289 tcf from 1986, recovering 57% of the 1979-86 decline.

U.S. gas production is expected to decline slightly in 1991 due to the marginal increase in consumption and rising imports. Marketed natural gas production will fall 1% to 18.06 tcf.

Last year domestic gas production rose 1.1% to 18.24 tcf. Much of the gain came from replenishment of underground storage, which

had been drawn down due to record cold weather in December 1989.

Imports of gas last year moved up 7.1% to 1.48 tcf. Imports from Canada increased 5.1% to 1.409 tcf. LNG imports from Algeria increased to 71 bcf. This year total imports will gain 4.7% to 1.55 tcf. Canadian imports will increase 4% to 1.465 tcf, and LNG imports will increase to 85 bcf.

The wellhead price of natural gas averaged \$1.69/Mcf in 1990 for the third consecutive year. The average price was \$1.67/Mcf in 1987. The static gas price, despite seasonal swings, contrasts with crude price volatility of recent years. This also has been the case in the past. Gas prices peaked in 1984—3 years after crude oil prices—at \$2.66/Mcf. Prices didn't fall as rapidly as oil prices in 1986.

With weak demand growth and the possibility of an oil price drop sometime in 1991, gas prices are not expected to increase this year.

Majors' drilling forecast

U.S. drilling to rise unless oil prices slump

G. Alan Petzet
Exploration Editor

U.S. well completions will post a strong increase in 1991 unless oil prices drop sharply.

Gas drilling supported by federal tax credits will remain active in 1991. But the high crude oil prices that revived shallow oil drilling in second half 1990 may not persist.

Oil & Gas Journal's latest estimate is that the industry drilled more wells in 1990 than either the 31,700 estimated in January 1990 or the 34,320 forecast in July 1990.

January through November figures, latest available at the time of OGJ's drilling forecast, indicated that more than 43,000 permits to drill would be issued in the U.S. during 1990.

The permit totals were especially high in states where coalbed methane and tight gas sands drilling, supported by tax credits, are most wide-

spread.

For most of the year operators were trying to meet a yearend 1990 deadline to spud such wells to ensure that gas sold from them during the 1990s would be eligible for the tax credits. Filing of intents to drill toward that end, therefore, was brisk.

In October Congress extended the drilling permit through yearend 1992 and the eligibility period through 2002.

Conventional gas drilling remains in the doldrums. Gas prices probably won't rise enough to boost drilling in 1991.

Here are highlights of Oil & Gas Journal's early year U.S. drilling forecast for 1991:

- The active rotary rig count will average 1,100, compared with 1,010 in 1990.

- Operators will drill 39,172 wells, compared with 36,706 completions in 1990.

- They will drill more than 6,700 wildcats, compared

State	Wells completed 1990			Wells planned 1991		
	Total wells	Wildcat wells	Field wells	Total wells	Wildcat wells	Field wells
Alabama	242	11	231	83	11	72
Alaska	193	9	184	262	14	248
Arkansas	7	4	3	5	4	1
California						
Onshore	2,341	26	2,315	2,439	39	2,400
Offshore	13	0	13	20	3	17
Colorado	165	4	161	49	6	43
Florida	0	0	0	3	2	1
Illinois	107	1	106	76	0	76
Indiana	0	0	0	2	0	2
Kansas	298	12	286	236	2	234
Louisiana	507	102	405	482	148	334
Louisiana-North	42	0	42	33	0	33
Louisiana-South	86	21	65	100	39	61
Louisiana-Offshore	379	81	298	349	109	240
Michigan	53	12	41	46	12	36
Mississippi	16	8	8	20	8	12
Montana	27	2	25	43	0	43
Nebraska	4	1	3	5	0	0
Nevada	4	4	0	3	3	0
New Mexico-East	230	10	220	174	12	162
New Mexico-West	165	0	165	54	1	53
North Dakota	24	12	12	39	11	28
Ohio	3	3	0	0	0	0
Oklahoma	185	18	167	263	25	238
Pennsylvania	66	0	66	61	0	61
Texas*	1,392	109	1,283	1,378	126	1,252
Dist. 1	13	1	12	38	8	30
Dist. 2	11	3	8	13	2	11
Dist. 3	55	22	33	68	24	44
Dist. 4	162	16	146	132	25	107
Dist. 5	51	2	49	22	12	10
Dist. 6	113	2	111	154	2	152
Dist. 7-B	16	0	16	8	0	8
Dist. 7-C	47	2	45	59	3	56
Dist. 8	372	8	364	281	8	273
Dist. 8-A	277	2	275	322	5	317
Dist. 9	7	0	7	3	1	2
Dist. 10	44	4	40	16	2	14
Offshore	68	36	32	53	27	26
Utah	9	4	5	21	7	14
Virginia	10	0	10	17	0	17
West Virginia	17	0	17	11	0	11
Wyoming	273	16	257	139	21	118
U.S. total	6,351	368	5,983	5,933	455	5,478
Western Canada	332	91	241	342	108	234
Alberta	202	50	152	200	54	146
Saskatchewan	69	13	56	55	7	48
British Columbia	53	21	32	69	44	25
Manitoba	1	0	1	15	0	15
Northwest Terr.	7	7	0	3	3	0
Eastern offshore	0	0	0	1	1	0

* Districts and offshore do not add to Texas total because one operator provided only Texas land and offshore totals.

Oil & Gas Journal well forecast for 1991

State	1990 estimate			1991 forecast			
	Total wells	Total wildcats	Total footage (1,000 ft)	Total wells	Total wildcats	Field wells	Total footage (1,000 ft)
Alabama.....	2,025	251	6,545	2,310	286	2,024	7,466
Alaska.....	185	10	1,901	200	11	189	2,055
Arizona.....	5	0	18	8	1	7	29
Arkansas.....	328	44	1,487	345	47	298	1,565
California.....	2,510	93	6,355	2,835	105	2,730	7,178
California offshore.....	35	0	238	29	0	29	197
Colorado.....	1,222	304	6,609	1,276	318	958	6,901
Florida.....	11	2	131	9	2	7	107
Georgia.....	1	0	0	0	0	0	0
Illinois.....	853	345	1,649	895	362	533	1,730
Indiana.....	190	51	254	211	57	154	282
Iowa.....	0	0	0	1	0	1	1
Kansas.....	2,740	844	8,837	2,901	894	2,007	9,356
Kentucky.....	1,686	365	3,431	1,800	421	1,379	3,663
Louisiana.....	1,790	178	13,388	1,882	188	1,694	14,209
North.....	830	65	3,781	850	66	784	3,872
South.....	420	77	4,586	457	84	373	4,990
Offshore.....	540	36	5,021	575	38	537	5,346
Michigan.....	1,158	853	3,181	1,247	919	328	3,426
Mississippi.....	306	89	2,631	327	95	232	2,812
Missouri.....	17	0	53	20	0	20	63
Montana.....	382	33	1,216	424	36	388	1,350
Nebraska.....	137	73	689	149	80	69	749
Nevada.....	65	48	339	72	53	19	375
New Mexico-East.....	688	74	4,481	708	76	632	4,611
New Mexico-West.....	1,770	46	6,503	1,909	50	1,859	7,014
New York.....	136	6	381	152	6	146	426
North Dakota.....	277	130	2,398	309	145	164	2,675
Ohio.....	1,139	35	4,612	1,250	39	1,211	5,061
Oklahoma.....	3,554	235	19,455	3,611	238	3,373	19,767
Oregon.....	11	3	26	14	4	10	33
Pennsylvania.....	1,437	36	6,077	1,550	39	1,511	6,555
South Dakota.....	13	2	78	17	2	15	102
Tennessee.....	60	4	105	85	6	79	148
Texas.....	9,923	1,720	53,982	10,254	1,769	8,485	55,813
District 1.....	1,014	182	3,723	1,001	179	822	3,676
District 2.....	419	129	2,532	440	136	304	2,659
District 3.....	707	235	5,327	725	241	484	5,463
District 4.....	739	180	5,761	709	173	536	5,527
District 5.....	252	37	1,341	275	40	235	1,464
District 6.....	620	55	4,911	650	57	593	5,149
District 7-B.....	1,197	232	3,566	1,236	240	996	3,682
District 7-C.....	925	167	5,179	979	177	802	5,481
District 8.....	1,483	98	8,891	1,555	103	1,452	9,322
District 8-A.....	956	144	5,434	997	151	846	5,667
District 9.....	1,169	215	4,031	1,212	223	989	4,179
District 10.....	312	27	2,093	330	28	302	2,214
Offshore.....	130	19	1,193	145	21	124	1,331
Utah.....	175	56	1,013	195	62	133	1,129
Virginia.....	25	3	129	37	4	33	190
West Virginia.....	843	78	3,845	890	82	806	4,059
Wyoming.....	1,009	306	5,165	1,250	379	871	6,399
Total.....	36,706	6,347	167,200	39,172	6,776	32,396	177,494
Western Canada.....	6,159	3,334	24,572	6,439	3,470	2,969	25,627
Alberta.....	4,396	2,646	18,586	4,511	2,716	1,795	19,073
Saskatchewan.....	1,357	508	4,146	1,482	554	928	4,528
British Columbia.....	299	154	1,476	316	163	153	1,559
Manitoba.....	98	16	305	112	19	93	349
Northwest Terr.....	9	9	60	18	18	0	119
Eastern offshore.....	0	0	0	7	2	5	63
Eastern land.....	59	21	109	72	25	47	132

A 26 year record of U.S. well completions

Year	Total wells	Total footage	Total wildcats	Year	Total wells	Total footage	Total wildcats
1990*	36,706	167,200,000	6,347	1977	45,855	215,695,878	10,140
1989	30,401	137,492,000	5,884	1976	40,940	187,289,586	9,317
1988	34,015	158,883,000	6,702	1975	38,884	181,039,993	9,459
1987	36,253	163,848,000	6,903	1974	33,037	153,776,399	8,969
1986	39,015	177,641,000	7,156	1973	27,692	139,424,738	7,771
1985	70,806	316,778,000	12,208	1972	27,934	138,796,562	7,551
1984	84,963	368,796,000	15,138	1971	26,268	127,255,952	7,131
1983	75,738	316,617,464	13,845	1970	28,173	138,559,527	7,436
1982	83,889	375,382,919	15,882	1969	32,187	157,107,859	9,701
1981	89,234	406,520,453	17,430	1968	30,559	144,970,447	8,879
1980	89,486	311,444,837	12,870	1967	32,234	141,356,463	8,876
1979	51,890	243,685,430	10,735	1966	36,384	182,445,209	10,313
1978	50,061	238,386,248	11,030	1965	39,501	181,427,015	9,466

*Estimated.

Source: 1965-89 American Petroleum Institute; 1990 OGJ estimate

with more than 6,300 in 1990.

- They will drill nearly 177.5 million ft of hole, and well depth will average 4,531 ft.

- Major operators will drill 5,933 wells, down 6.6% from 1990, mainly because their coalbed methane programs in Alabama, Colorado, and New Mexico are winding down.

- Drilling in western Canada will total 6,439 wells in 1991, compared with 6,159 completions in 1990.

Drilling on upswing

OGJ's estimate of 36,706 completions for 1990 is 6.9% higher than the July estimate and 15.8% higher than the January 1990 estimate (OGJ, Jan. 29, 1990, p. 64; July 30, 1990, p. 72).

The number of permits to drill, as measured by Salomon Bros. Inc., started off low but increased erratically later in the year.

The number of permits issued in 29 states remained below 3,000/month in January through March, then reached almost 4,000/month during October and never fell below 3,000/month through November.

In fact, 3,976 permits were issued during October, 61.8% more than in March and the most issued in a single month since February 1986.

Through the year's first 11 months, 18.5% more permits were issued than in the same period of 1989. The 1990 average through November is

3,100/month.

Figures from Petroleum Information Corp. for January through November 1990, extrapolated to a calendar year, indicated that operators filed more than 43,000 intents to drill during the year in all states. PI tracks more states than does Salomon.

In 1991 as in 1990, operators plan heavy development campaigns in California heavy oil areas; coalbed methane, Devonian shale, and other tax credit supported gas; and oil and gas in the Gulf of Mexico.

Oil drilling growth

High oil prices in second half 1990 and start of construction of pipelines to transport gas for use in thermal enhanced oil recovery projects have boosted drilling in California heavy oil fields.

OGJ estimates that 2,510 land wells were drilled in California during 1990 and that another 2,835 will be drilled this year. The July 1990 estimate for California land drilling was 1,640 wells.

Drilling also has been up sharply in other shallow oil areas and regions where horizontal drilling is active.

North Louisiana operators completed an estimated 830 wells in 1990, compared with an estimated 700 in 1989. They plan 850 wells this year.

Shallow oil drilling increases are expected in eastern and western Kentucky, Pennsylvania, Illinois, Texas Railroad Commission Dists. 7C and 8, and Southeast

New Mexico.

Oil drilling will be up in not-so-shallow Nebraska and Utah.

In South Texas Dist. 1, completions are estimated to have more than doubled in 1990 vs. 1989, due mostly to Upper Cretaceous Austin chalk horizontal drilling. But drilling may begin to level off in the area this year.

North Dakota oil drilling, much of it due to Mississippian Bakken shale horizontal work, posted a good gain in 1990, and growth is expected this year.

Completion totals in Oklahoma and Kansas are expected to change little in 1991 from 1990 and 1989.

Shallow gas surges

Several states are experiencing record well totals from shallow gas drilling.

An annualized 2,600 permits to drill were issued in Alabama in 1990, far more than double the 1989 number. OGJ forecasts that 2,310 wells will be drilled there in 1991, compared with 2,025 in 1990.

Upper Cretaceous Fruitland coalbed methane drilling remains very busy in the San Juan basin of Northwest New Mexico and Southwest Colorado. Operators completed an estimated 1,770 wells there in 1990. OGJ predicts 1,909 wells for 1991.

Coalbed methane and Devonian shale drilling is raising completion tallies in Wyoming, West Virginia, Virginia, and Montana.

It appeared until late 1990 that a federal tax credit for coalbed gas from wells drilled by yearend would expire, and operators in the Black Warrior basin and other shallow coalbed methane areas rushed drilling programs to qualify.

Many of the rigs used to drill shallow coal gas wells are not counted by the large service companies.

Conventional gas completions picked up in 1990 in the Gulf of Mexico off Louisiana and Texas. OGJ estimates 540 completions for 1990 and forecasts 575 wells for 1991 off Louisiana and 130 completions for 1990 and 145 wells for 1991 off Texas.

Canadian outlook

OGJ expects Canadian drilling to climb to 6,439 wells in 1991, up 4.5% from the estimated 1990 pace.

Oil drilling is languishing in western Canada, but shallow gas programs have lifted completion totals.

Horizontal drilling is growing rapidly in Alberta and Saskatchewan, and an average of about 100 wells/year is expected for 1990 and 1991.

One major oil company reported having drilled one well in the Beaufort Sea in 1990, but no surveyed operator listed plans to drill there this year.

Off eastern Canada, five Cohasset/Panuke field wells are due in 1991, but Hibernia development will not start until later in the 1990s.

U.S. fields with reserves exceeding 100 million bbl

State	Field	Disc. date	1990 prod.	Cum. prod. 1-1-91 1,000 bbl	Est. rem. reserves	Est. No. wells
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ALABAMA*

Citronelle, 1955	1,596	151,242	3,619	443
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ALASKA

Endicott, 1978	37,740	120,083	255,260	55
Granite Point, 1965	1,533	113,270	15,467	26
Kuparuk River, 1969	109,029	725,268	775,971	345
Lisburne, 1967	14,827	64,126	146,173	70
McArthur River, 1965	4,540	540,098	35,460	82
Middle Ground Shoal, 1962	3,179	161,655	4,821	42
Prudhoe Bay, 1967	473,607	17,078,307	4,421,693	769
Swanson River, 1957	1,852	213,192	6,148	30

*Includes 33.18 million bbl of condensate (includes 201.17 million bbl of condensate)

ARKANSAS*

Smackover, 1922	2,292	561,971	5,708	1,975
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CALIFORNIA

San Joaquin Valley				
Belridge South, 1911	54 181	791 489	320 880	4,301
Buena Vista, 1909	1 602	650 446	35 099	764
Coalinga, 1890	11,509	775 574	139,459	2,042
Coalinga Nose, 1938	883	500 663	7 451	75
Coles Levee North, 1938	384	161 290	3 383	69
Cuyama South, 1949	380	219 041	6 088	92
Cymric, 1909	8,919	218 038	76 302	959
Edison, 1928	861	136 529	17 503	594
Elk Hills, 1911	31,298	958 982	528 894	1,006
Fruitvale, 1928	447	116 511	12 751	217
Greeley, 1936	120	112 964	1 446	25
Kern Front, 1912	2,191	176 717	51 579	799
Kern River, 1899	44 080	1,297 104	650 375	6,779
Kettleman North Dome, 1928	172	456 998	948	45
Lost Hills, 1910	6,403	190 280	60 280	1,650
McKittrick, 1896	1 648	270 873	86 868	760
Midway-Sunset, 1894	58,906	1,997 711	255 499	9,385
Mount Poso, 1926	5,617	275 072	67 458	468
Rio Bravo, 1937	57	116 220	507	11
Yowlumne, 1974	4,722	92 112	17 199	63
Coastal Area				
Carpinteria, 1966	1,878	92 184	15 632	125
Cat Canyon E. & W., 1908	1,332	291 721	29 203	325
Dos Cuadras, 1969	3,468	220 392	46 552	138
Elwood, 1928	209	106 206	1 782	7
Hondo, 1969	8,240	107 986	94 128	24
Orcutt, 1901	858	167 526	8 586	137
Point Pedernales, 1982	6,392	24 312	148 171	10
Rincon, 1927	980	150 834	14 095	180
San Ardo, 1947	4,110	416 038	115 216	430
Santa Maria Valley, 1934	1,037	200 635	16 209	125
South Mountain, 1916	719	147 396	10 623	361
Ventura, 1919	6,534	908 069	83 699	468
Los Angeles Basin				
Beta, 1976	4 613	50 601	104 326	71
Beverly Hills, 1900	1 888	126 329	38 643	91
Brea Olinda, 1880	1,948	388 032	50 649	727
Coyote East, 1909	556	109 766	12 109	91
Coyote West, 1909	613	251 284	6 166	65
Dominguez, 1923	569	270 419	6 295	106
Huntington Beach, 1920	3,842	1 075 320	63 092	562
Inglewood, 1924	2 380	350 534	49 068	262
Long Beach, 1921	2 189	914 172	12 801	338
Montebello, 1917	565	193 520	9 104	127
Richfield, 1919	1 152	191 737	24 840	192
Santa Fe Springs, 1919	1 012	615 060	18 379	140
Seal Beach, 1924	746	204 641	12 595	157
Torrance, 1922	1 259	214 857	33 073	278
Wilmington, 1932	26 118	2 344 984	442 878	1 695

*Revised to reflect only developed portion of field. Original estimate of total field reserves is 350 million bbl.

COLORADO*

Rangely, 1933	12,125	763,829	37,000	521
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State	Field	Disc. date	1990 prod.	Cum. prod. 1-1-91 1,000 bbl	Est. rem. reserves	Est. No. wells
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FLORIDA*

Jay, 1970	4,335	369,712	46,844	55
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ILLINOIS*

Clay City, 1938	2,092	398,160	3,908	2,860
Lawrence, 1906	2,546	399,887	7,000	831
Louden, 1938	876	390,337	1,924	739
Main, 1906	1,710	237,023	4,500	1,487
New Harmony, 1938	800	155,293	3,600	569
Salem, 1938	865	228,312	3,300	129

KANSAS*

Bemis-Shuts, 1928	1,120	246,359	3,200	807
Chase-Silica, 1931	850	303,808	2,730	914
El Dorado, 1917	840	300,226	1,500	776
Hall-Gurney, 1931	905	148,038	2,500	1,021
Trapp, 1937	1,050	228,497	2,526	844

LOUISIANA*

Offshore				
•Bay Marchand Bk. 2, 1949	8,825	615,097	41,175	223
•Eugene Island Bk. 330, 1930	6,665	284,395	40,603	131
•Grande Isle Bk. 16, 1948	3,373	270,714	78,660	53
•Grande Isle Bk. 43, 1956	3,900	281,328	76,616	91
•Mississippi Canyon Bk. 194, 1980	—	—	—	35
•Main Pass Bk. 41, 1957	2,025	242,831	18,407	77
•Main Pass Bk. 306, 1969	1,560	205,145	75,059	92
•South Marsh Island Bk. 128, 1974	—	93,063	15,464	79
•South Pass Bk. 27, 1954	3,650	135,410	65,250	315
•South Pass Bk. 61, 1968	4,600	165,007	35,400	151
•South Pass Bk. 62, 1965	3,225	111,804	76,154	87
•South Pass Bk. 65, 1965	2,550	107,361	82,764	60
•Ship Shoal Bk. 204, 1968	990	58,068	36,932	31
•Ship Shoal Bk. 207, 1967	750	89,384	36,434	25
•Ship Shoal Bk. 208, 1962	2,811	166,532	58,911	49
•South Timberlake Bk. 21, 1939	1,836	220,103	43,269	46
•South Timberlake Bk. 135, 1956	1,107	141,956	23,044	35
•West Delta Bk. 30, 1949	5,339	457,119	36,336	144
•West Delta Bk. 73, 1962	2,950	195,766	79,225	72
Onshore South				
Bay de Chenre, 1941	305	97,131	17,203	27
Bay St. Elaine, 1928	396	165,720	24,380	25
Bayou Sole, 1941	502	162,639	2,147	27
Black Bay West, 1953	1,780	148,739	6,492	68
Calilou Island, 1930	1,765	606,492	69,759	146
Cote Blanche Bay West, 1940	550	183,512	44,456	79
Delta Farms, 1944	590	116,241	6,129	33
Garden Island Bay, 1934	1,085	223,486	29,729	143
Golden Meadow, 1938	568	136,679	3,050	156
Grand Bay, 1938	450	171,372	2,902	37
Hackberry, East, 1927	586	110,129	6,561	62
Hackberry, West, 1928	1,075	144,446	3,941	113
Iowa, 1931	97	99,544	456	26
Jennings, 1901	210	116,859	600	183
Lafitte, 1935	1,221	257,845	7,009	111
Lake Barre, 1929	885	205,940	18,144	42
Lake Pelto, 1929	402	117,990	16,425	27
Lake Washington, 1931	2,409	247,439	11,327	93
Leeville, 1931	556	142,766	6,101	44
Paradis, 1939	607	127,905	7,345	36
Quarantine Bay, 1937	883	174,311	14,117	42
Timbalier Bay, 1938	—	—	—	—
onshore	567	297,734	22,607	64
Venice, 1937	669	183,423	6,045	60

State	Field	Disc. date	1990 prod.	Cum. prod. 1-1-91 1,000 bbl	Est. rem. reserves	Est. No. wells
Vinton, 1910			297	161,610	775	106
Weeks Island, 1945			930	227,925	19,370	36
West Bay, 1940			845	230,339	14,262	69

North						
Caddo-Pine Island 1905			2,820	367,007	8,900	11,608
Delhi, 1944			530	212,789	33,569	65
Haynesville, 1921			608	169,697	2,000	142
Homer, 1919			355	99,138	2,375	196
Rodessa, 1935			350	106,785	2,461	89

MICHIGAN*

Albion-Scipio, 1957			43	132,173	9,957	382
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MISSISSIPPI*

Baxterville, 1944			1,986	243,366	6,189	192
Heidelberg, 1944			2,390	179,630	7,350	234
Tinsley, 1939			649	220,985	1,889	99

MONTANA*

Bell Creek, 1967			601	130,770	21,670	101
Cut Bank, 1926			765	163,912	35,655	615
Pine, 1951			1,170	107,571	3,238	97

NEW MEXICO

Denton, 1949			810	140,363	5,000	175
Empire-Abo, 1957			1,231	222,783	47,217	398
Eunice-Monument, 1929			2,260	130,594	5,714	857
Hobbs, 1928			6,590	311,019	17,500	583
Maljamar, 1926			1,653	148,408	4,800	848
Vacuum, 1929			9,327	452,107	30,673	1,245

NORTH DAKOTA*

Beaver Lodge, 1951			1,520	114,490	13,666	65
Billings Nose, 1978			1,941	65,097	47,767	204
Little Knife, 1977			2,158	55,751	53,254	135
Mondak, 1976			295	13,643	82,326	113

OKLAHOMA*

Burbank, 1920			890	538,530	6,593	1,031
Eola-Robberson, 1921			825	134,805	6,529	507
Fitts, 1933			2,292	204,692	7,208	568
Glenn Pool, 1905			815	329,581	3,285	618
Golden Trend, 1945			3,489	481,275	23,750	1,238
Healdton, 1913			1,527	337,949	6,259	968
Hewitt, 1919			1,970	272,323	10,030	740
Oklahoma City, 1928			984	818,103	4,033	193
Postle, 1960			1,050	108,569	12,745	218
Sho-Vel-Tum, 1919			16,595	1,200,895	34,405	6,982
Sooner Trend, 1965			3,466	302,872	12,672	3,404

TEXAS

Railroad Commission District 2-South						
Greta, 1933			474	148,558	11,542	97
Lake Pasture, 1953			1,698	91,222	9,206	197
Tom O'Connor, 1934			5,950	760,230	42,618	648
West Ranch, 1938			1,901	384,115	6,599	304

District 3-Gulf Coast						
Anahuac, 1935			610	286,230	13,770	94
Conroe, 1931			2,484	732,474	28,469	263
Giddings, 1971			9,593	280,418	175,750	2,380
Hastings, 1934			1,819	697,023	68,912	188
Magnet Withers, 1936			1,411	113,824	2,797	141
Oyster Bayou, 1941			670	161,619	16,681	35
Thompson, 1931			2,319	478,390	21,510	199
Tomball, 1983			279	121,629	9,295	66
Webster, 1937			3,706	580,906	12,292	192

District 4-South						
Agua Dulce-Stratton, 1928			340	147,323	24,051	132
Borregos, 1945			138	114,340	19,867	39
Kelsey, 1938			178	115,253	35,853	59
Plymouth, 1925			205	123,268	2,855	65
Seeligson, 1925			179	271,869	55,158	64
TCB, 1944			48	113,088	52,150	16

State	Field	Disc. date	1990 prod.	Cum. prod. 1-1-91 1,000 bbl	Est. rem. reserves	Est. No. wells
White Point, E., 1938			90	104,217	6,157	58
District 5-East						
Alabama Ferry, 1983			2,111	19,263	81,737	272
Van, 1928			2,547	527,258	11,320	432

District 6-East						
East Texas, 1930			34,704	5,078,708	918,797	9,501
Farway, 1960			1,830	196,602	13,866	100
Hawkins, 1940			6,350	834,798	29,218	436
Neches, 1953			960	105,911	4,105	172
Quitman, 1948			1,211	123,817	5,969	173

District 7C-West Central						
Big Lake, 1923			519	130,935	2,505	70

District 8-West						
Andector, 1946			591	183,124	5,264	42
Block 31, 1945			2,747	225,865	9,253	271
Cowden, N., 1930			14,897	516,488	45,000	1,352
Cowden, S. Foster, Johnson, 1932			8,425	517,944	27,000	1,678
Dollarhide, 1945			2,585	198,896	9,000	221
Dune, 1938			2,368	187,696	14,008	750
Fullerton, 1942			7,575	362,975	7,225	912
Goldsmith, 1934			5,690	767,662	21,606	1,562
Howard Glasscock, 1925			6,009	415,125	15,383	2,157
Iatan, E., 1926			3,016	148,768	7,215	1,314
Joran, 1937			824	130,676	2,050	240
Keystone, 1930			1,511	316,163	6,291	756
McElroy, 1926			8,888	481,085	41,264	1,954
Means, 1934			6,265	240,671	30,000	744
Midland Farms, 1944			2,655	248,211	12,385	292
Sand Hills, 1931			2,030	252,553	17,254	1,305
TXL, 1944			1,415	266,431	3,585	600
Waddell, 1927			555	101,855	2,649	193
Ward Estes, N., 1929			4,213	371,258	69,355	1,621
Westbrook, 1923			2,110	92,114	11,890	667
Yates, 1926			22,001	1,221,306	733,199	1,023

District 8A-West						
Anton-Insh, 1944			2,978	182,423	18,092	245
Cogdell Area, 1949			1,199	294,722	38,700	208
Diamond M., 1948			1,845	242,595	12,886	317
Kelly-Snyder, 1948			8,608	1,262,074	87,926	787
Levelland, 1938			17,105	517,105	55,200	3,250
Prentice, 1951			5,002	171,294	22,300	413
Salt Creek, 1950			10,335	268,091	27,665	196
Seminole, 1936			16,845	557,909	110,383	449
Slaughter, 1936			17,898	1,065,551	135,550	3,018
Spraberry Trend, 1951			18,490	690,622	37,809	7,546
Wasson, 1936			25,937	1,764,036	140,961	2,046
Welch, 1942			3,106	150,334	25,911	651

District 10-Panhandle						
Panhandle, 1921			6,859	1,436,157	30,000	12,263

UTAH*

Altamont, 1955			2,815	94,614	235,000	232
Aneth, 1956			5,513	365,083	23,225	463
East Anschutz Ranch, 1979			7,320	97,066	710,417	40
Red Wash, 1951			914	79,526	11,413	154

WYOMING*

Brady, 1973			1,514	57,990	45,705	22
Byron, 1918			830	122,457	5,828	61
Elk Basin, 1915			2,695	437,536	20,080	179
Frannie, 1928			730	117,601	3,338	62
Garland, 1906			2,495	167,933	7,790	229
Grass Creek, 1914			2,114	189,626	5,850	283
Hamilton Dome, 1918			2,390	235,210	5,800	245
Hartzog Draw, 1976			4,875	77,141	272,983	160
Hite, 1969			467	76,392	54,906	100
Lance Creek, 1918			146	108,075	250	27
Little Buffalo Basin, 1914			2,121	123,308	6,879	174
Lost Soldier, 1916			3,000	213,724	7,500	92
Oregon Basin, 1912			7,511	403,895	17,489	506
Painter Reservoir, 1979			1,320	47,559	77,780	35
Salt Creek, 1889			4,162	638,489	16,041	1,218
Wertz, 1921			2,500	106,267	15,000	65
Whitney Canyon-Carter Creek, 1978			1,286	12,296	102,262	32

*Petroleum Information data

•Offshore

Global markets, drilling hinge on oil price

Oil price will be the critical variable in international markets and worldwide drilling this year.

And as long as extraordinary tensions linger in the Middle East, the oil price will be difficult to predict.

Given historically unusual freedom of movement in a crisis last year, the oil price held the market in tight balance after Iraq invaded Kuwait on Aug. 2.

The process took its toll on economic growth. This year elevated oil prices will continue to restrain economic activity and products demand as they stimulate drilling.

International Energy Agency (IEA) expects total oil demand in free-market countries to average 52.03 million b/d in the first three quarters of 1991, down 1.3% from the same period of 1990.

And drilling outside the U.S. and Canada will rise, with size of the increase depending on oil price levels and when and the extent to which tensions ease in the Middle East.

The market

This year's demand slump will be an industrialized world phenomenon.

IEA predicts demand among members of the Organisation for Economic Co-operation and Development (OECD) will average 36.5 million b/d in the first 9 months of 1991, down 1.1 million b/d from the comparable period of 1990.

But demand among developing countries will continue to increase, gaining 400,000 b/d from a year earlier to 15.53 million b/d.

For the first three quarters, IEA assumes higher oil prices and less total economic activity than in 1990.

According to latest IEA estimates, total consumption by free-market countries increased 1.5% to 53.1 million b/d for all of 1990. OECD demand increased marginally to 37.8 million b/d, and non-OECD consumption jumped 4.1% to 15.3 million b/d.

Fourth quarter 1990 OECD

demand, however, was down sharply from its level of a year earlier because of the price jump and economic slowdown: 38.5 million b/d vs. 39.3 million b/d.

Most of the fourth quarter demand decline came in North America, where weather was a factor. December 1989 was extremely cold, which boosted heating fuel consumption and exaggerated the basis for comparison.

The late 1990 economic slump, aggravated if not caused by the oil price jump, is evident in the North American consumption decline from the third quarter to the fourth. Demand usually rises between the quarters due to colder weather.

Restoring balance

The demand slump helped keep physical shortages from developing in the aftermath of the Iraqi invasion.

An international embargo blocked crude and product exports of 4.2 million b/d. With fourth quarter demand projected before the invasion at 1.6 million b/d above the third quarter level, and with only 3.6 million b/d of spare production capacity believed available within members of the Organization of Petroleum Exporting Countries, the market faced a theoretical fourth quarter shortfall of 2.2 million b/d.

Prices shot up as a consequence. The price of world export crudes peaked at \$36.11/bbl the week of Sept. 28, compared with averages of \$13.49/bbl in June and \$14.93/bbl in July.

The price spurt slashed consumption in free-market countries. IEA's latest estimate of fourth quarter demand, 54.1 million b/d, is 1.2 million b/d less than what it was projecting just before the Iraqi invasion.

Higher prices also boosted supply. Stocks contributed about 500,000 b/d in the fourth quarter, and non-OPEC production increased by about the same amount.

Most important, OPEC members, led by Saudi Ara-

FORECAST REVIEW

bia, increased output by more than what earlier was considered possible. As a result, the market balanced at IEA's reduced level of fourth quarter demand, with little production capacity to spare.

IEA projects a decline in non-OPEC supply to 28.6 million b/d in the first quarter of 1991. If OPEC production doesn't exceed fourth quarter 1990's 22.7 million b/d of crude—including 500,000 b/d estimated from Iraq and Kuwait—and 1.9 million b/d of NGL, stocks will have to provide 400,000 b/d to meet demand projected at 53.6 million b/d.

Demand will decline in the second and third quarters, relaxing the pressure on stocks and OPEC production capacity. At projected demand levels and with no stock change, the call on OPEC crude would fall to 20.1 million b/d in the second quarter and 21.2 million b/d in the third.

OPEC production

According to IEA, OPEC production by the countries other than Iraq and Kuwait moved up from an average 18.8 million b/d in the second quarter of 1990 to an estimated 22.2 million b/d in the fourth quarter. The U.S. Central Intelligence Agency had estimated available production capacity in these countries at 22.04 million b/d.

Saudi Arabia accounted for 70% of the increase. Its production average rose from 5.4 million b/d in the second quarter to 7.8 million b/d in the fourth. Prior to the invasion, Saudi capacity had been estimated at 7 million b/d.

Venezuela and the United Arab Emirates each boosted production by about 300,000 b/d to 2.3 million b/d in the fourth quarter. Nigeria and Libya increased production by 200,000 b/d each, Nigeria to 1.9 million b/d and Libya to 1.5 million b/d. Those pro-

duction levels are expected to continue through the first quarter of 1991.

The IEA estimates that Iraqi production fell from 3.1 million b/d in the second quarter to 400,000 b/d in the fourth. Kuwaiti production slumped to about 100,000 b/d from 1.7 million b/d.

OPEC faces the formidable task of allocating production quotas whenever the crisis ends and Iraq and Kuwait resume oil exports. Other major OPEC producers—including Saudi Arabia, the U.A.E., and Venezuela—are expanding production capacity, so with resumed production from Iraq and Kuwait, OPEC will be able to produce far more crude than the market needs.

The drilling outlook

This price uncertainty clouds the drilling outlook.

If crude prices average \$18/bbl in 1991 compared with an estimated \$19.50/bbl for 1990, the international rig count may average only 950 compared with 935 in 1990.

However, if crude prices average \$25/bbl in 1991, the international rig count will average 1,010, according to Oil & Gas Journal projections. Figures exclude the U.S.S.R. and Eastern Europe.

Baker Hughes Inc. figures show little change in the total international rig count for November 1989 but some important country increases and declines.

There were 900 rigs active in November 1990, five more than a year earlier.

The largest year to year November increases were in Mexico, 109 vs. 87; Venezuela, 37 vs. 29; U.K., 46 vs. 36; Italy, 27 vs. 18; and Saudi Arabia, 11 vs. 4.

Yugoslavia had 26 rigs running in November 1990, down from 38 in November 1989, and Syria had 14 vs. 22.

Baker Hughes has not received reports since early August from Iraq or Kuwait. Iraq had 27 active rigs and Kuwait 4 in November 1989.



About this report...

Although horizontal drilling remains a "hot" technology, as shown by the Journal's latest survey which is summarized in this report, technology development also continues in other areas. One such area is high-pressure jet-assisted drilling, which could result in deep cuts in drilling costs.

Also covered in this report are turnkey horizontal drilling projects and the proper design and procedures to drill high-pressure, high-temperature formations. The latter are critical to forthcoming drilling projects in the Central Graben of the North Sea.

Horizontal drilling technology keeps advancing

Guntis Moritis
Drilling/Production Editor

The upward surge in horizontal drilling projects shows no signs of slackening and innovative applications of the technique continue.

Dual horizontal laterals are the latest innovation that may accelerate the spread of horizontal drilling.

Horizontal drilling in 1990 increased markedly over the previous year, according to the Journal's latest survey conducted with its Energy Data Base group. The survey shows over 460 wells that have not appeared in OGJ's previous two surveys. Most of these wells had horizontal laterals greater than 1,000 ft in the reservoir.

In addition, operators indicated that they drilled 62 horizontal wells with laterals less than 1,000 ft.

Because of the large number of wells drilled, a tabulation of the survey is not included in this issue. Information on obtaining a complete listing is available from the OGJ Energy Data Base.

The number of wells listed is a substantial increase from the 135 in last year's survey and represents about half of the estimated 1,000 horizontal wells drilled in 1990.

The main thrust of horizontal drilling remains centered on the Austin chalk

DEA joint-industry project speeds transfer of horizontal

A major impetus to the rapid growth of horizontal well technology has been a joint industry-Drilling Engineering Association (DEA) project.

Since 1987, Maurer Engineering Inc. (MEI) of Houston has been conducting a \$3.5 million, Phase 1 DEA 44 study on horizontal well technology. The study is sponsored by 105 oil, gas, and service companies from 20 different countries.

Initially, 15 companies funded the project, but interest and participation grew so rapidly that the project expanded to include reservoir engineering, completions, production, and drilling of horizontal wells.

Results

"The DEA-44 project has allowed rapid transfer of this technology among service companies and oil and gas operators, and has had a major impact on the implementation of horizontal well technology globally," says Mark Moennich, senior specialist engineer for BP Canada. The main objective of the Phase 1 project was to develop information to allow participants to accurately assess this technology and implement it into their operations.

Thirteen computer programs and 18 manuals for reservoir screening, horizontal well planning, torque/drag analysis, and drilling and completion technology were developed, including a four-volume well-planning manual summarizing all aspects of the project. In addition, data from over 100 horizontal wells were documented and distributed.

Based on this success, the participants asked MEI to continue this effort in a Phase 2 follow-up study which was initiated on Jan. 1, 1991. Phase 2 will focus on actual well behavior. Phase 1 was based on theoretical and laboratory studies because few horizontal wells had been drilled. In addition, Phase 2 will provide multidiscipline training programs aimed at the growing need for personnel training in appropriate horizontal applications.

Another primary method of accelerating technology transfer has been through technical forums. The technical forums update operators and service companies on recent developments

with horizontal well technology. MEI, operators, and service companies present latest developments during informal presentations at the forums.

Regional Phase 1 forums were held in the U.S., Canada, Europe, and Australia. In Phase 2, forums are planned for these areas plus South America. The third international forum is to be held in Calgary, June 17-19.

Future implications

John Vozniak, assistant project manager for MEI, expressed that data from horizontal wells drilled by DEA-44 participants show that the average cost of a horizontal well compared to a vertical well is 1.2 to 2 times the cost of an average vertical well in the same field without major problems.

He also points out that this average varies greatly with the experience level, well depth, and well objectives. Most costs of a horizontal well are associated with building the curve, and the incremental costs of drilling the horizontal section are often insignificant.

Many operators now are drilling horizontal wells until they reach a formation anomaly such as a pinchout or fault, or they continue to drill until prespecified values of torque and/or loads are met.

Bob Knoll, president of H-Tech Petroleum Consulting Inc. and the Canadian liaison to the DEA-44 project, indicates that average costs of horizontal wells compared to vertical wells are relative. For instance, some shallow wells in Canada that are 300-400 m TVD have horizontal productive intervals that are 2-3 times the TVD.

The production increases can be 15-20 times that of a vertical well. Therefore, the average cost of this horizontal well compared to a vertical well may be misleading because of the production increase that is obtained.

In re-entries of deep, vertical wells where a portion of the casing is milled out, a cement plug is set, and a horizontal well is drilled, the costs can be anywhere from 0.3 to 0.8 times that of a vertical well.

MEI feels that horizontal wells will continue to

trend in Texas and the Bakken shale of North Dakota. No new areas have appeared that can rival these in the number of horizontal wells. But the potential is there.

Both Canada and Wyoming will see more activity in 1991. And horizontal wells will be drilled in such diverse areas as Gabon, Congo, U.K., Indonesia, Denmark,

Zaire, Germany, Australia, The Netherlands, and Trinidad.

The rapid growth in activity is also indicated by the Texas Railroad Commission granting 1,098 horizontal well permits during 1990. This is 84.6% of the total 1,298 granted in Texas since the first one in 1984.

A sizable drilling backlog ex-

ists in Texas. Only 546 horizontal wells, 42% of those permitted, had been completed by December 1990.

Dual laterals

For the first time, dual lateral wells are included in the survey. This type of multiple-drain well is expected by some to eventually represent

a significant portion of horizontal wells.

All three of the dual wells listed in the survey were drilled in the Austin chalk of the Pearsall field.

In the Cox & Perkins Well No. 2, one 1,310-ft lateral was drilled at 6,745 ft. The length of the other lateral at 6,783 ft was 1,400 ft. The well took 95 days to drill and

well technology

have a major impact on the oil industry, with increased use in multilayered, naturally fractured, water/gas coning, EOR, and miscible flood applications.

A novel EOR technique using multibranch horizontal wells to improve sweep efficiency may find use in the near future. Horizontal wells will also allow consolidation of wells at the surface in environmentally sensitive areas.

Vozniak states that horizontal wells should find increased use in gas reservoirs because they reduce near well bore gas-turbulence flow effects, which can contribute to greater increases in flow rate and recovery than obtained from oil wells. Horizontal wells will also be important for underground gas storage since they allow much faster production rates (3-8 times faster) during peak periods, such as cold weather. These wells reduce the volume of unrecoverable base gas by 25-50%. In addition, parallel horizontal gas wells provide better drainage than vertical wells, which have cusps that may not be drained by the radial drainage patterns of vertical wells.

This technology has applications for methane drainage from coal seams, both from the surface and from underground mines. Horizontal wells are also used with in situ coal combustion (i.e., where gas is produced by burning coal underground), since horizontal wells expose much more of the formation and thereby improve burning rates and burning efficiency.

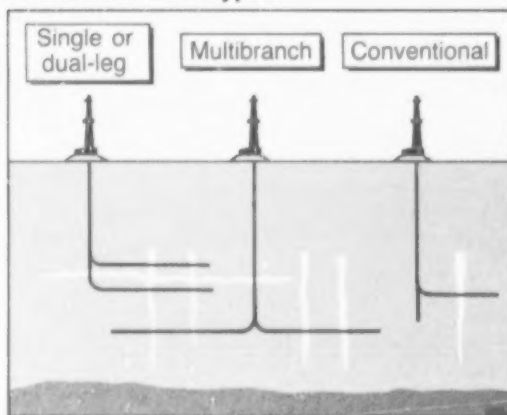
Future developments

The DEA-44 project has identified future horizontal tools being developed which will greatly enhance horizontal drilling including:

- Flexible motors that drill around short radius turns
- Measurement-while-drilling systems with survey sensors located at the drill bit
- Coiled tubing drilling systems that allow drill pipe to be reeled into and out of the wells at high speed.

These tools should decrease the overall drilling time and costs of horizontal wells and further improve overall recovery.

Horizontal well types



Multibranch horizontal wells, as shown in the figure, have already been successfully drilled, including a recent Austin chalk well which initially produced 2,300 bo/d. William C. Maurer, president of MEI, estimates that by the year 2000 approximately 25-30% of all horizontal wells will be multibranch wells.

Horizontal wells can be excellent exploration tools for oil and gas because they provide geological and reservoir data over a long lateral distance (3,000-5,000 ft) and provide information on faults and other major discontinuities in the reservoir. This allows better reservoir management, resulting in increased recovery and improved economics. This is seen in Prudhoe Bay, the North Sea, and naturally fractured reservoirs such as the Austin chalk and Bakken shale.

MEI predicts that approximately 10,000 wells/year will be drilled by the year 2000. This translates into a \$15 billion market for operators, drilling contractors, service companies, and research firms by the year 2000.

The only major factor that limits growth of horizontal wells is the lack of available drilling motors, survey equipment, and experienced horizontal drilling personnel (mainly rig crews and directional drillers).

complete.

Production from this well is with a rod pump through one string of tubing. No production figures were made available.

Petro-Hunt Corp. drilled the M.R. McDermond No. 1 dual well in 46 days. The down dip lateral is 3,164 ft long at a depth of 7,037 ft. In the opposite direction, the

up dip lateral extends 2,305 ft at 6,898 ft.

An electric submersible pump was producing the well at a rate of 2,292 bo/d, 384 bw/d, and 1.65 MMcf/d of gas.

A dry-hole dual lateral was drilled by Wolverine Exploration. Its Wagner 155-1-H was drilled in 43 days. The upper lateral, at 6,093 ft, had a horizontal displacement of 3,500

ft. The lower lateral was 2,676 ft, at 6,210 ft.

1991 plans

This year will be another active year for horizontal drilling. Our respondents indicate that 735-777 horizontal wells will be drilled with horizontal laterals greater than 1,000 ft in length. Another 43-45

wells are planned with laterals less than 1,000 ft (see table).

Considering the continuing boom in the Austin chalk and the number of small companies involved, the actual number could easily be twice as many.

In 1991, Union Pacific Resources Co. is planning to drill 135 horizontal wells,



TRIPPING PIPE in a Pearsall field horizontal well. (Photo courtesy of Hughes Tool Co.)



A BOTTOM HOLE assembly for drilling horizontal wells is ready to run into a Pearsall field well. (Photo courtesy of Hughes Tool Co.)

more than any other survey respondent. Most of these wells, 115, will be in the Austin chalk trend of Texas. The other 20 are planned for the Niobrara formation in Wyoming. A number of analysts have predicted that the Niobrara formation of Wyoming and Colorado has the potential of becoming the next hot area for horizontal drilling.

Meridian Oil Inc. and Oryx Energy Co. are two companies that have been very active in the past and will continue to have vibrant programs. Meridian plans between 45 and 50 wells in Texas and North Dakota. Oryx has plans for 50 or more wells at unspecified locations.

Petro-Hunt plans to triple its activity to 60-75 horizontal wells in 1991. In 1990, it drilled 22 wells.

Conoco Inc. is another company whose program will substantially increase. It plans to drill 55 wells in 1991, up from 13 in 1990.

Mobil Oil Corp. has one of the more diverse programs planned for 1991. It includes drilling horizontal wells in the North Sea, Canada, Germany, Gulf of Mexico, Indonesia, and Texas.

Records

In 1990, Elf Aquitaine Petroleum's well C-2 offshore The Netherlands, Block L-7, had the deepest true vertical depth (TVD) at 13,322 ft. The length of the horizontal was a short 305 ft at 95°, although the horizontal displacement was 1,050 ft.

For wells with laterals longer than 1,000 ft, Marathon Oil U.K. Ltd. drilled, in the North Brae field, a 92°, 1,615-ft horizontal at a TVD of 12,640 ft.

In last year's survey, Nederlandse Aardolie Mij. BV (NAM) was listed with the deepest horizontal lateral. Its well in Block L-13, offshore The Netherlands, was drilled at a TVD of 11,484 ft.

None of the wells in this

year's survey match the horizontal length in the reservoir or horizontal displacement of Unocal Corp.'s A-16 well, drilled offshore California in 1989. That well had a horizontal displacement of 12,740 ft and a length in the reservoir of 5,743 ft. Maximum inclination angle was 87.5°.

The longest horizontal displacement in this year's survey is Elf's well in the Buffalo field, offshore Angola. Horizontal displacement was 9,104 ft with a horizontal lateral extending 4,429 ft. Maximum angle was 90.9°.

Meridian's Pearsall field well No. 1-337H, 5,208-ft horizontal lateral, was the longest in this year's survey.

The well with the greatest maximum angle this year was Amoco Canada Petroleum Co. Ltd.'s Sturgeon Lake South No. 2. The well, with a short 200-ft horizontal lateral, climbed to an inclination of 121°. The TVD was 8,300 ft.

This year's survey did not include any well that matched the production rate of 30,000 bo/d reported last year for Norske Hydro's Troll field horizontal test well. The most prolific oil producer listed was Mobil Oil's Ness field well 9/13b-49, in the U.K. portion of the North Sea. The production was given as 16,000 bo/d and 8.25 MMcfd.

Another prolific horizontal producer was Marathon Oil's North Brae field well B-17, 10,000 bo/d, also in the U.K. North Sea.

In the Pearsall field, GLG Energy reported the best oil producer. Its well Petty No. 1 produced at a rate of 3,340 bo/d and 0.3 MMcfd. The well has an electric submersible pump.

Texaco had three Gulf of Mexico horizontal gas wells under test. Its East Cameron well B-14 was producing 18 MMcfd, well B-12 was producing 12 MMcfd, and the South Marsh Island well D-10 was producing 10.3 MMcfd.

1991 horizontal drilling plans

Wells with horizontal lengths greater than 1,000 ft			Wells with horizontal lengths less than 1,000 ft	
Company Name	Planned for 1991	Location	Planned for 1991	Location
Alcorn International	2	Offshore Philippines		
Amoco Production	5	Wyo., N.D., North Sea (Norway), and Gabon		
Apache	2	N.D. and Wyo.		
ARCO Oil & Gas	13	Arjuna, Indonesia (3) and Prudhoe Bay, Alas. (6); Lisburne, Alas. (4)		
Bechtel Petroleum	2	Naval Petroleum Reserve No. 1, Elk Hills, Calif.		
Belden & Blake	1	Northwest N.M.		
Benson-Montin-Greer Drilling	1			
CER	1			
Citation Oil & Gas	6	Pearsall field, Tex.		
Chevron USA	2	Winkler Co., Tex. (1), Undisclosed location (1)		
Coastal Oil & Gas	1	Williston basin - Bakken, N.D.		
Conoco	55	N.D., Tex., Okla., Alas., Gulf of Mexico, U.K., Netherlands		
Cox & Perkins	20	Austin chalk, Tex.	2	Austin chalk, Tex.
CS Resources Ltd	15-20	Heavy oil - Lloydminster, Sask.		
Delphi International	1	Musselshell Co., Mont.		
Diamond Petroleum	24	Austin chalk, Tex.		
Elf Aquitaine	5	Gabon, Congo, Netherlands, and U.K.		
Encor	1	Southeast Sask.		
Exxon USA	12-15	Tex., N.D., and Wyo.		
Exxon USA - Central Div.	7	Giddings field, Tex. (5) and East Tex. (2)		
Exxon USA - Southwestern Div.	2	Laramie Co., Wyo. and Billings Co., N.D.		
Future Petroleum	3	Texas Panhandle		
Gemini Exploration	15			
GLG Energy	20	Pearsall field		
Great West Energy & Exploration	6	Wilson, La Salle, Frio, Gonzales, and Lee Co.'s, Tex.		
Gulf Canada Resources	15	Canada	1	Canada
Hinton Production	7	Pearsall field - Frio Co., Tex.	1	Pearsall field, Frio Co., Tex.
Husky Oil Operations	6	Rainbow Lake, Alta. (2) and Edam, Sask. (4)		
John Brown E&C	3	Rifle, Colo.		
Jolen Operating	3	Southern Okla.		
Kerr-McGee Canada Ltd.	1			
Lacy & Byrd Inc.	1	Gonzales Co., Tex.		
Larry Barnes Petroleum	10	Austin chalk, South Tex.		
Leede Oil & Gas	8-10	Austin chalk, Tex. and Bakken, N.D.		
Louisiana Land & Exploration	1			
Maersk Oil & Gas	10	Dan and Tyra fields offshore Denmark		
Marathon	24-27	McArthur River, Alas., North Sea, and Stephens Co., Okla. Williston basin, N.D., Brazos, Burleson, and Fayette Co.'s, Tex.	24-26	Albion/Scipio trend, Mich., Reagan and Pecos Co.'s, Tex., Park Co., Wyo.
Marathon Oil UK Ltd	2	North and South Brae fields, offshore U.K.		
Meridian	45-50	N.D. and Tex.	2	West Texas
Merrion Oil & Gas	2-3	San Juan basin, N.M. (Entrada)		
Mobil E&P Services	10	U.K. North Sea (1) and Canada (9)	4	Reitbrook oil field, Germany (1); Main Pass Block 9, Gulf of Mexico (1); Arun, Indonesia (1); and West Ranch, Tex. (1)
Modern Exploration	6	Austin chalk, Tex.		
Oryx	50			
Petrofina SA	1	Onshore Zaire		
Petro-Canada Resources			1	Brazeau River Nisku, Alta.
Petro-Hunt	60-75	15 Austin chalk - Frio, La Salle, Gonzales, and Wilson Co.'s, Tex.		
Preussag	4	Darching, Reitbrook, and Olheim fields, Germany		
Royal Oil & Gas	6	Karnes, Gonzales, Dimmit, and La Salle Co.'s, Tex.		
Sabre Operating	8	Pearsall field, Tex.		
Santa Fe Energy Op Ptnrs	3	Various locations		
Sceptre Resources Ltd	11	Alta., Sask.		
Selm Petroleum			2	Vega field, offshore Sicily
Shell Canada	1	Alta.		
Slawson Exploration	12	Bakken, N.D.		
Snyder Oil	9	Colo., Wyo.		
Texaco	8-9	Lost Hills and Midway-Sunset fields, Calif. Various locations	4-5	Kern River and La Barge fields, Sublette Co., Wyo.
Texaco Latin America/ West Africa	2			
Texahoma Oil & Gas	22-24	Gonzales, Dimmit, and La Salle Co.'s, Tex.		
Tex-Hex	5			
Trinidad & Tobago Oil			1	Barrackpore, Trinidad
Union Pacific Resources	135	Austin chalk, Tex. (115) and Niobrara, Wyo. (20)		
Unocal Netherlands B.V.	6	Q1 Block, offshore Netherlands		
Western Mining	5-7	Carnarvon basin, Australia		
Windsor Exploration	14	Tex.		
Total	736-777		43-45	

The East Cameron well B-14 is at a shallow TVD of 1,768 ft, but the South Marsh Island

well is much deeper at 10,087 ft TVD. Amoco had one of the

more unusual motives for drilling a horizontal well. "Under town" was listed as the

reason for drilling its Salt Creek field well, in Natrona County, Wyo.



OIL & GAS JOURNAL

Annual refining survey

Lou Ann Thrash
Director of Editorial Surveys

FOR a better understanding of the survey the following information may be of help.

Calendar-day figures reported in this survey are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365.

Stream-day figures represent the amount a unit can process when running full capacity for short periods.

This survey includes only facilities charging whole crude, plus lube plants not charging whole crude.

Totals

When an asterisk (*) appears beside a figure in the crude capacity columns, this indicates that the figure was not reported but has been converted into either a calendar-day or stream-day figure using the crude conversion factor of 0.95.

Legend

Hydrocracking includes those processes where 50% or more of the feed is reduced in molecular size; for hydrotreating 10% of the feed or less is reduced in molecular size; and for hy-

drotreating, essentially no reduction in molecular size of feed occurs.

Values for hydrogen volumes represent either generation or upgrading to 90 + % purity.

Catalytic reforming definitions are:

- Semiregenerative is characterized by shutdown of the reforming unit at specified intervals or at the operator's convenience for regeneration of catalyst in situ.

- Cyclic is characterized by continuous or continual regeneration of catalyst in situ in any one of several reactors that can be isolated from and returned to the reforming operation. This is accomplished without changing feed rate or octane.

- Other includes: Nonregenerative—catalyst replaced by fresh catalyst; continuous—continuous regeneration of a part of the catalyst in a special regenerator followed by continuous addition to the reactor; moving-bed catalyst systems.

Detailed U.S. breakdown by company, plant, and state starts next page. Included are:

- U.S. crude distillation and downstream capacity by states.

- Detailed distillation and downstream capacities by U.S. refinery.

- List of refineries that became inactive during the survey year.

Legend

Numbers identify processes in table

THERMAL PROCESSES

1. Gas-oil cracking
2. Thermal cracking
3. Visbreaking
4. Coking (fluid)
5. Coking (delayed)
6. Other

CATALYTIC CRACKING

1. Fluid
2. Other

CATALYTIC REFORMING

Semiregenerative:

1. Conventional catalyst
2. Bimetallic catalyst

Cyclic:

3. Conventional catalyst
4. Bimetallic catalyst

Other:

5. Conventional catalyst
6. Bimetallic catalyst

CATALYTIC HYDROCRACKING

1. Distillate upgrading
2. Residual upgrading
3. Lube-oil manufacturing
4. Other

CATALYTIC HYDROREFINING

1. Residual desulfurizing
2. Heavy gas-oil desulfurizing
3. Cat-cracker and cycle-stock feed pretreatment
4. Middle distillate
5. Other

CATALYTIC HYDROTREATING

1. Pretreating cat-reformer feeds
2. Naphtha desulfurizing
3. Naphtha olefin or aromatics saturation
4. Straight-run distillate
5. Other distillate
6. Lube-oil "polishing"
7. Other

ALKYLATION

1. Sulfuric acid
2. Hydrofluoric acid

AROMATICS/ISOMERIZATION

1. BTX
2. Hydrodealkylation
3. Cyclohexane
4. C₈ feed
5. C₉ feed
6. C₈ and C₉ feed

HYDROGEN

1. Steam methane reforming
2. Steam naphtha reforming
3. Partial oxidation
4. Cryogenic
5. Other

Survey of operating refineries in the U.S. (state capacities as of January 1, 1991)

State	No. plants	Crude capacity — bbl/d		Thermal operations				Charge capacity, bbl/d				Production capacity, bbl/d				Hydrogen (MMcld)	Coke (100)	
		— bbl/d	— bbl/d	Vacuum distillation	Thermal operations	—Cat. cracking — Fresh feed	Recycle	Cat. reforming	Cat. cracking	Cat. hydro-refining	Cat. hydro-treating	Alky. Poly.	Aromatics-isomerization	Lubes	Asphalt (MMcld)			
Alabama	4	165,750	171,800	49,000	12,000	—	—	—	31,000	—	29,800	48,500	—	7,000	—	19,500	6.0	400
Alaska	6	242,700	254,400	6,000	29,500	—	—	—	12,000	9,000	—	12,000	—	6,500	—	8,000	12.8	—
Arizona	2	14,210	16,000	3,000	—	—	—	—	—	—	—	—	—	—	—	4,660	—	—
Arkansas	3	60,470	63,000	28,000	—	18,500	775	9,000	—	—	—	20,000	4,800	3,000	3,500	9,500	0.5	—
California	30	2,212,448	2,309,200	1,334,630	538,000	656,000	14,000	545,500	413,000	573,500	937,900	132,500	17,900	29,400	89,500	1,053.4	20,962	
Colorado	3	91,200	101,000	41,100	4,200	27,500	1,000	22,900	5,000	—	35,700	3,800	—	—	5,000	5,000	6.0	200
Delaware	1	140,000	150,000	95,000	46,000	69,000	5,000	56,000	19,000	—	110,000	17,000	3,370	—	—	26,500	40.0	2,180
Georgia	2	35,500	38,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hawaii	2	143,050	150,000	71,250	13,000	20,000	—	13,000	18,000	—	14,500	5,625	1,500	—	—	2,400	20.1	—
Illinois	7	973,500	1,031,000	403,000	124,400	378,000	10,000	303,800	66,500	35,000	575,300	96,000	33,400	4,600	44,100	66.8	6,300	
Indiana	4	436,900	441,500	233,200	28,000	171,500	4,000	99,500	—	86,000	180,800	36,700	38,000	6,400	51,000	—	1,550	
Kansas	8	351,225	370,960	128,650	52,000	129,500	3,500	93,800	3,190	44,400	172,000	39,100	41,000	—	7,000	—	1,980	
Kentucky	2	218,900	226,300	92,000	57,600	100,000	—	53,000	—	40,400	142,300	13,000	17,600	8,500	30,000	—	—	
Louisiana	19	2,330,141	2,436,000	901,400	444,700	787,500	11,300	499,800	172,000	277,000	1,001,100	211,500	123,800	37,600	53,500	167.1	16,025	
Michigan	4	123,700	134,095	38,000	—	46,500	1,300	33,500	—	17,000	50,800	9,000	6,000	—	18,000	—	—	
Minnesota	2	285,600	299,220	192,000	58,000	78,000	1,000	55,500	—	86,500	127,000	19,150	23,300	—	49,000	20.0	2,800	
Mississippi	5	358,600	378,679	275,000	80,000	80,000	—	95,600	68,000	192,800	59,800	19,700	5,500	3,600	40,600	217.5	4,250	
Montana	4	138,600	145,500	55,600	7,700	54,400	7,600	37,700	4,900	14,000	101,350	12,800	6,500	—	23,500	19.3	435	
Nevada	1	4,500	4,700	2,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—
New Jersey	6	494,250	520,947	251,200	31,000	256,000	25,000	76,500	—	65,000	244,200	36,000	36,300	8,500	73,000	11.0	1,100	
New Mexico	4	77,300	84,107	13,900	—	33,800	5,500	19,800	500	—	30,300	6,400	4,000	—	3,200	—	—	
New York	1	39,900	42,000	25,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North Dakota	1	58,000	60,000	—	—	26,000	3,600	12,100	—	—	19,100	4,300	5,100	—	—	—	—	—
Ohio	4	454,150	478,000	153,000	33,000	174,000	1,000	162,600	87,200	23,000	170,500	29,400	63,900	—	19,000	72.0	1,475	
Oklahoma	7	409,500	427,792	145,500	20,500	146,000	5,840	101,500	5,000	26,000	154,800	36,100	32,900	10,000	12,100	10.0	1,260	
Oregon	1	—	—	16,000	—	—	—	—	—	—	—	—	—	—	11,500	—	—	—
Pennsylvania	7	731,300	771,000	317,500	—	250,000	8,600	195,070	51,000	42,000	424,000	47,500	20,250	17,350	47,000	49.5	—	—
Tennessee	1	60,000	62,000	12,000	—	30,000	—	10,000	—	—	31,000	5,500	4,000	—	3,500	—	—	—
Texas	31	3,882,550	4,109,900	1,741,500	331,800	1,635,800	125,550	1,140,400	282,000	827,500	2,383,650	323,400	310,375	88,800	49,900	623.0	11,754	
Utah	6	154,500	160,400	48,100	8,500	55,400	9,100	31,100	—	7,100	34,100	14,500	8,400	—	1,700	—	350	—
Virginia	1	53,000	56,000	29,000	14,000	27,500	2,000	10,200	—	—	26,500	—	—	—	—	—	750	—
Washington	7	521,225	543,754	255,500	72,000	118,500	7,000	128,500	52,000	25,500	195,000	30,100	4,250	—	16,000	80.0	3,700	—
West Virginia	2	29,680	30,800	10,850	—	—	—	4,900	4,500	—	3,900	—	—	—	6,440	—	2.7	—
Wisconsin	1	32,300	34,000	20,500	—	11,000	1,000	8,000	—	5,800	9,000	1,300	2,000	—	13,500	—	—	—
Wyoming	5	164,600	171,500	72,600	8,000	64,000	10,500	36,950	—	29,000	54,750	10,500	2,500	—	16,550	—	—	—
Total	194	15,478,549	16,303,954	7,066,480	2,016,300	5,444,400	264,165	3,801,520	1,260,790	2,448,900	7,270,050	1,106,075	806,345	224,690	908,710	2,477.7	77,481	—

U.S. refineries: location, capacities, types of processing

Company and location	Crude capacity		Vacuum distillation	Thermal operations		Charge capacity, bbl/d		Cat. cracking		Cat. hydro-Cat. hydro-	Production capacity, bbl/d		Hydrogen (mllct/d)	Coke (bbl)
	— bbl/d	— bbl/d		— operations	— operations	— Cat. cracking	— Cat. cracking	— Cat. cracking	— Cat. cracking		— Cat. hydro-	Alky. —Poly-			Aromatics-isomerization	Lubes	Asphalt
ALABAMA														
Coastal Mobile Refining Co.—Mobile Bay	14,250	15,000	14,000	—	—	—	—	—	—	—	—	—	—	—
Gannett Energy Inc.—Theodore	26,500	28,500	—	—	—	—	—	—	—	—	—	—	—	—
Hunt Refining Co.—Tuscaloosa	45,000	47,000	15,000	12,000	—	—	—	—	—	—	—	—	—	—
Louisiana Land & Exploration Co.—Saraland	80,000	81,300	20,000	—	—	—	—	—	—	—	—	—	—	—
Total	165,750	171,800	49,000	12,000	—	—	—	—	—	—	—	—	—	—
ALASKA														
ARCO Alaska Inc.—Kuparuk	12,000	12,000	—	12,000	—	—	—	—	—	—	—	—	—	—
Prudhoe Bay	17,500	17,500	—	17,500	—	—	—	—	—	—	—	—	—	—
Chevron U.S.A. Inc.—Kenai	22,000	22,500	—	—	—	—	—	—	—	—	—	—	—	—
Marathon Petroleum—North Pole	112,000	115,000	6,000	—	—	—	—	—	—	—	—	—	—	—
Petro Star Inc.—North Pole	7,200	7,400	—	—	—	—	—	—	—	—	—	—	—	—
Tasoro Petroleum Corp.—Kenai	72,000	80,000	—	—	—	—	—	—	—	—	—	—	—	—
Total	242,700	254,400	6,000	29,500	—	—	—	—	—	—	—	—	—	—
ARIZONA														
Intermountain Refining Co.—Fredonia	5,710	6,000	2,000	—	—	—	—	—	—	—	—	—	—	—
Sunbelt Refining Co.—Randolph	8,500	10,000	6,000	—	—	—	—	—	—	—	—	—	—	—
Total	14,210	16,000	8,000	—	—	—	—	—	—	—	—	—	—	—
ARKANSAS														
Berry Petroleum Co.—Stevens	5,700	6,000	3,000	—	—	—	—	—	—	—	—	—	—	—
Cross Oil & Refining Co. Inc.—Smackover	6,770	7,000	—	—	—	—	—	—	—	—	—	—	—	—
Loon Oil Co.—El Dorado	48,000	50,000	25,000	—	—	—	—	—	—	—	—	—	—	—
Total	60,470	63,000	28,000	—	—	—	—	—	—	—	—	—	—	—
Solvent extraction: 5,500 bbl														
CALIFORNIA														
Anchor Refining Co. Inc.—McKittrick	10,000	11,000	7,000	—	—	—	—	—	—	—	—	—	—	—
Atlantic Richfield Co.—Carson	223,000	235,000	112,000	56,000	82,000	48,000	22,000	—	—	—	—	—	—	—
Total	233,000	246,000	119,000	56,000	82,000	48,000	22,000	—	—	—	—	—	—	—
Chemical Refining Corp.—Signal Hill														
Chevron U.S.A. Inc.—El Segundo	14,200	16,000	114,000	61,100	62,000	51,000	45,000	40,000	460,000	14,000	—	—	—	—
Total	247,200	262,000	233,000	117,100	144,000	99,000	67,000	80,000	460,000	14,000	—	—	—	—

Company and location	Crude capacity b/d	Vacuum distillation	Thermal operations	Charge capacity, b/d			Production capacity, b/d							
				— Cat. cracking — Fresh feed	Recycle	Cat. reforming	Cat. hydro-Cat. hydro- refining	Cat. hydro- treating	Alky. *Poly.	Aromatics- isomerization	Lubes	Asphalt	Hydrogen (MMcf/d)	Coke (t/d)
Richmond [†]	270,000	280,000	175,000	63,000	—	60,000	50,000 30,000 30,500	66,000 18,200	7,000 2,100	—	11,000	11,000	150.0	—
Conoco Inc.—Santa Maria	9,500	10,000	7,800	—	—	—	—	—	—	—	—	6,800	—	—
Edgerton Oil Co. Inc.—Long Beach	41,600	44,730	25,000	—	—	—	—	27,000	14,000	—	—	17,000	104.0	1,100
Exxon Co.—Benicia	128,000	132,000	67,000	65,000	11,000	32,000	37,000	22,000 12,500 17,000	2,000	—	—	—	—	—
Fletcher Oil & Refining Co.—Carson Springs	28,750	30,000	17,000	12,000	—	5,000	—	212,000	—	—	—	6,300	—	—
Golden West Refining Co.—Santa Fe Springs	44,000	46,000	25,000	13,500	—	19,000	11,000	12,000	3,000	—	—	4,000	11.0	—
Huntway Refining Co.—Benicia	8,400	9,000	7,500	—	—	—	—	—	—	—	—	4,500	—	—
Wilmington	5,500	5,000	5,000	—	—	3,000	—	—	—	—	—	3,500	—	—
Kern Oil & Refining Co.—Bakersfield	20,000	22,000	—	—	—	—	—	—	—	—	—	—	—	—
Lunday-Thagaard Co.—South Gate	7,000	7,370	7,500	—	—	36,000	21,700	68,000	17,000	—	—	2,400	137.0	2,900
Mobil Oil Corp.—Torrance	123,000	130,000	95,000	63,000	—	15,000	4,000	—	—	—	—	—	—	—
Pacific Refining Co.—Hercules	52,250	55,000	25,000	—	—	8,500	—	9,000	—	—	—	12,000	—	—
Paramount Petroleum Corp.—Paramount	37,050	39,000	24,000	—	—	—	—	10,500 7,000	2,800	1,500	—	—	19.0	550
Powerline Oil Co.—Santa Fe Springs	46,550	49,000	26,000	12,500	—	10,000	8,000	13,500 6,000	—	—	—	5,000	118.0	132
San Joaquin Refining Co.—Bakersfield	18,000	20,000	14,000	—	—	28,000	28,000	50,000	9,000	—	4,000	11,000	—	—
Shell Oil Co.—Martinez	140,100	148,000	101,500	66,000	1,000	—	—	21,000 6,300	2,200	—	4,500	—	—	—
Wilmington	133,300	139,000	75,000	42,000	—	24,000	—	25,000 14,000 57,000	8,600	—	—	—	36.0	2,500
Sunland Refining Corp.—Bakersfield	15,000	15,000	—	—	—	—	—	—	—	—	—	2,000	—	—
Ten By, Inc.—Orland	4,000	5,000	—	—	—	1,500	—	—	—	—	—	—	—	—
Texaco Refining & Marketing Inc.— Bakersfield	48,000	49,000	23,000	—	—	22,000	14,300	215,000 30,000	8,300	—	—	—	21.0	690
Wilmington	55,000	100,000	54,000	30,000	—	39,000	26,000	15,000	—	—	—	—	15.0 348.0	1,970
Tosco Corp.—Martinez	131,900	143,000	118,000	60,000	2,000	20,000	29,000	250,000	13,000	—	—	—	80.0	1,500
Ultramar, Inc.—Wilmington	68,000	72,000	42,000	38,000	—	23,000	—	22,000	10,500	9,000	—	—	49.4	1,200
Unocal Corp.—Los Angeles	108,000	111,000	83,000	247,000	—	14,500	27,500	54,000	10,000	—	—	—	—	—
San Francisco (includes Santa Maria)	118,000	125,100	74,100	—	—	34,000	34,000	23,000 12,000 14,500	—	7,400	4,800	—	65.0	2,620
Wilco Chemical Corp./Golden Bear Divi- sion—Oildale	10,348	11,000	10,230	—	—	—	—	—	—	—	5,100	4,000	—	—
Total	2,212,448	2,339,200	1,334,630	656,000	14,000	545,500	413,000	937,900	132,500	17,900	28,400	89,500	1,053.4	20,962

Solvent extraction: 50,000 b/d.

† TKC plant down due to fire. Rebuilt unit scheduled on-line July 1991.

COLORADO

Colorado Refining Co. — Commerce City

28,000

35,000

10,000

8,500

9,500

1,200

—

—

Company and location	Crude capacity b/d	Vacuum distillation	Thermal operations	Charge capacity, b/d		Cat. hydro- cracking	Cat. hydro- treating	Alky. *Poly.	Aromatiza- tion	Production capacity, b/d			Hydrogen (MMcfd)	Coke (t/d)
				— Cat. cracking — Fresh feed	Recycle					Lubes	Asphalt			
Conoco Inc. — Denver	48,000	50,000	23,000	19,000	1,000	210,000	110,000	2,600	.....	.....	.....	5,000	.....	.....
Landmark Petroleum Inc. — Fruta	15,200	16,000	8,100	.....	.....	3,400	5,000	12,800	.....	.....	.....	.....	16.0	200
Total	91,200	101,000	41,100	27,500	1,000	22,900	35,700	3,600	.....	.....	.....	5,000	6.0	200
DELAWARE														
Star Enterprise — Delaware City	140,000	150,000	95,000	69,000	5,000	218,000	.....	11,500	2,900	.....	.....	.....	140.0	2,180
						38,000	.....	5,500	2,470	.....	.....	.....	.....	.....
Total	140,000	150,000	95,000	69,000	5,000	56,000	19,000	110,000	17,000	3,370	.....	.....	40.0	2,180
GEORGIA														
Amoco Oil Co. — Savannah	28,000	30,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	22,500	.....	.....
Young Refining Corp. — Douglasville	7,500	8,200	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,000	.....	.....
Total	35,500	38,200	.....	.....	.....	.....	.....	.....	.....	.....	.....	26,500	.....	.....
HAWAII														
Chevron U.S.A. Inc. — Barber's Point	52,800	55,000	31,250	20,000	.....	.....	3,500	14,500	1,500	.....	.....	1,300	2.5	.....
						.....	.....	11,125	.....	.....	.....	.....	.....	.....
Hawaiian Independent Refinery Inc. — Ewa Beach	90,250	95,000	40,000	13,000	.....	18,000	11,000	.....	.....	.....	.....	1,100	217.6	.....
Total	143,050	150,000	71,250	20,000	.....	13,000	14,500	5,625	1,500	.....	.....	2,400	20.1	.....
ILLINOIS														
Clark Oil & Refining Corp. — Blue Island Hartford	66,500	70,000	27,000	25,000	.....	30,500	20,500	6,000	4,000	.....	.....	7,000	2.5	750
	57,000	60,000	30,000	26,000	.....	12,000	24,000	8,000	.....	.....	.....	.....	.....	.....
						4,000	.....	.....	.....	.....	.....	.....	.....	.....
Indian Refining Co. — Lawrenceville	54,000	57,000	30,000	34,000	.....	15,000	.....	5,000	.....	.....	.....	5,000	.....	.....
														
Marathon Petroleum Co. — Robinson	195,000	205,000	62,000	43,000	.....	36,500	24,000	212,000	14,000	.....	.....	.....	25.0	1,200
						34,000	.....	.....	.....	.....	.....	.....	.....	.....
Mobil Oil Corp. — Joliet	180,000	200,000	88,000	98,000	.....	46,000	.....	225,000	.....	.....	.....	.....	.....	2,350
						.....	.....	79,000	.....	.....	.....	.....	.....	.....
Shell Oil Co. — Wood River	274,000	286,000	108,000	94,000	.....	18,000	33,500	22,000	4,500	4,600	28,500	3,600	111.0	2,000
						75,000	.....	79,500	.....	.....	.....	.....	.....	.....
Unio-Ven Co. — Lemont	147,000	153,000	58,000	58,000	10,000	29,800	.....	218,000	3,500	.....	.....	.....	.....	.....
						.....	.....	22,200	7,400	.....	.....	.....	.....	.....
						.....	.....	36,400	.....	.....	.....	.....	.....	.....
						.....	.....	39,000	.....	.....	.....	.....	.....	.....
						.....	.....	72,100	.....	.....	.....	.....	.....	.....
						74,300	.....	.....	.....	.....	.....	.....	.....	.....
Total	973,500	1,031,000	403,000	378,000	10,000	303,800	66,500	575,300	96,000	33,400	4,600	44,100	66.8	6,300

†Dimersol.

†Dimersol.

Company and location	Crude capacity bbl/d	Charge capacity, bbl/d			Production capacity, bbl/d									
		Vacuum distillation	Thermal operations	— Cat. cracking — Fresh feed	Cat. hydro-Cat. hydro- reforming refining	Cat. hydro- treating	Alky. Aromatics- Poly. isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)			
INDIANA														
Amoco Oil Co.—Whiting	350,000	360,000	203,000	28,000	145,000	4,000	85,000	86,000	87,000	29,000	14,000	6,400	45,000	1,550
Indiana Farm Bureau Cooperative Association Inc.—Mt. Vernon	20,600	21,500	7,200		7,000		4,000		45,000	22,000				
Lakeland Refining Corp.—Laketon	8,300	10,000	6,000						25,000					
Marathon Petroleum Co.— Indianapolis	48,000	50,000	17,000		19,500		10,500		6,000	1,700	2,000		3,500	
Total	428,900	441,500	233,200	28,000	171,500	4,000	99,500	86,000	180,800	36,700	38,000	6,400	51,000	1,550
Solvent extraction: †4,500														
KANSAS														
Coastal Refining and Marketing Inc.—Augusta	30,400	32,000	12,000		14,500		10,000		14,500	2,800	6,500		2,500	
El Dorado	29,925	31,500	10,000	5,500	19,000		6,500		4,000	2,800				
Wichita									7,000	3,500				
Farmland Industries Inc.—Coffeyville	59,600	62,000	21,500	12,000	25,000		16,000		26,500	6,000	8,000			700
Phillipsburg	26,400	27,460	10,000				5,300		6,500				2,000	
National Cooperative Refinery Association—McPherson	70,900	75,000	27,000	22,000	20,000	1,000	15,000		10,000	6,000	2,000			650
Texaco Refining & Marketing Inc.— El Dorado	78,000	83,000	32,000	12,500	31,500	2,500	18,500	44,000	16,000	9,500				
Total Petroleum Inc.—Arkansas City	56,000	60,000	16,150		19,500		18,000	3,190	20,000	12,500	15,000			610
Total	351,225	370,960	128,650	52,000	129,500	3,500	93,800	3,190	172,000	39,100	41,000		2,500	
Solvent extraction: †5,500 bbl. † includes C ₃ -C ₄ Isom. feed													7,000	1,960
KENTUCKY														
Ashland Petroleum Co.—Callettsburg	213,400	220,000	92,000	2,600	60,000		25,000	40,000	60,000	12,000	5,400	8,500	30,000	
				†55,000	†40,000		27,000		6,000	1,000	12,000			
Somerset Refinery Inc.—Somerset	5,500	6,300					1,000	4,400	40,000	29,000	200			
Total	218,900	226,300	92,000	57,600	100,000		53,000	40,400	142,300	13,000	17,600	8,500	30,000	
† ART. † Reduced crude converter. /Aromatics 5,000 C ₃ /C ₄ 12,000 C ₅ /C ₆ 12,000														
LOUISIANA														
American International Refinery, Inc.— Lake Charles	28,500	30,000					5,000		10,000			8,500	600	16.1
Atlas Processing Co., Division of Pennzoil—Shreveport	46,200	50,000	24,300						3,400					
									†6,700					

Company and location	Crude capacity b/d	Vacuum distillation b/d	Thermal operations	Charge capacity, b/d			Cat. hydro- cracking	Cat. hydro- refining	Cat. hydro- treating	Alky- Poly-	Aromatic- isomerization	Production capacity, b/d			Hydrogen (MMcfd)	Coke (td)
				— Cat. cracking — Fresh feed	Recycle	— Cat. feed —						Lubes	Asphalt			
BP Oil Co. — Belle Chasse	220,400	232,000	22,000	92,000	2,300	38,000	—	—	242,000	235,000	24,000	—	—	—	—	845
Calcasieu Refining Co. — Lake Charles	13,500	14,000	—	—	—	—	—	—	24,000	—	16,300	—	—	—	—	—
Calumet Lubricants Co. — Princeton	4,376	4,500	8,600	—	—	—	—	—	22,000	—	—	—	—	—	—	—
Canal Refining Co. — Church Point	9,865	10,000	—	—	—	1,900	—	—	4,500	—	—	3,600	900	—	14.5	—
CAS Refining Inc. — Mermentau	15,000	14,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cargo Petroleum Corp. — Lake Charles	320,000	330,000	75,000	150,000	—	32,000	45,000	40,000	106,000	23,000	4,000	9,000	—	—	—	4,000
Conoco Inc. — Lake Charles	159,500	167,000	63,000	42,500	—	16,000	—	—	28,000	7,500	23,000	—	—	—	—	3,650
			212,000	—	—	12,000	—	—	109,000	2,100	—	—	—	—	—	—
			60,000	—	—	—	—	—	13,000	33,200	12,500	16,500	12,000	—	—	4,980
Exxon Co. — Baton Rouge ¹	421,000	438,000	90,000	188,000	—	90,000	24,000	—	95,000	8,000	—	—	—	—	—	—
			183,000	—	—	—	—	—	2,500	—	—	—	—	—	—	—
			—	—	—	—	—	—	55,000	—	—	—	—	—	—	—
			—	—	—	—	—	—	17,000	—	—	—	—	—	—	—
			—	—	—	—	—	—	45,000	2,800	—	—	—	—	—	—
Hill Petroleum Co. — Krotz Springs	56,700	60,000	22,000	28,000	—	—	—	—	12,000	—	—	—	—	—	—	—
St. Rose	28,300	30,000	24,000	—	—	—	—	—	—	—	—	—	—	—	—	—
Kerr-McGee Refining Corp. — Cotton Valley	7,800	8,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Marathon Petroleum Co. — Garyville ⁴	255,000	263,000	125,000	90,000	—	45,000	—	—	71,000	26,000	21,500	—	40,000	—	—	—
			92,500	58,000	—	28,000	18,000	—	38,000	19,000	7,000	—	—	—	—	1,550
Mobil Oil Corp. — Chalmette	160,000	175,000	92,500	58,000	—	19,000	—	—	45,000	19,000	—	—	—	—	—	—
Murphy Oil USA Inc. — Meraux ²	97,000	100,000	40,000	35,000	2,500	23,000	—	—	24,000	8,700	—	—	—	—	—	—
Pleasant Refining Co. — Port Allen ³	47,000	50,000	18,000	19,000	1,500	10,000	—	—	29,000	3,700	—	—	—	—	—	—
Shell Oil Co. — Norco	215,000	220,000	78,000	19,000	—	16,000	35,000	70,000	10,000	15,000	—	—	—	—	70.0	1,000
			21,000	—	—	36,000	—	—	29,000	9,400	—	—	—	—	—	—
			17,700	85,000	5,000	40,000	50,000	—	28,000	14,500	12,500	—	—	—	182.5	—
			12,000	—	—	—	—	—	102,000	54,000	—	—	—	—	—	—
Star Enterprise—Convent	225,000	240,000	75,000	85,000	5,000	40,000	50,000	—	40,000	14,500	12,500	—	—	—	—	—
			—	—	—	—	—	—	1,001,100	211,900	129,800	37,600	53,500	187.1	16,025	—
Total	2,330,141	2,436,000	444,700	787,500	11,300	499,900	172,000	377,600	1,001,100	211,900	129,800	37,600	53,500	187.1	16,025	—

Solvent extraction: ¹8,900 b/d, ²12,000 b/d, ³8,000 b/d, ⁴30,000 b/d.

¹ Wax 1,200. Lube 5,500.

² Wax 2,000. Alky feed 43,000. ³ Dimersol.

MICHIGAN

Crystal Refining Co. — Carson City	4,000	6,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lakeside Refining Co. — Kalamazoo	5,600	5,895	38,000	27,000	1,300	1,000	18,500	3,000	21,000	4,000	—	—	18,000	—	—	—
Marathon Petroleum Co. — Detroit	68,500	71,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Petroleum Inc. — Alma	45,600	51,000	—	19,500	—	—	14,000	—	14,000	75,000	8,000	—	—	—	—	—

Total

123,700	134,095	38,000	46,500	1,300	33,500	17,000	50,800	9,000	8,000	—	—	—	—	—	—	—
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MINNESOTA

Ashland Petroleum Co. — St. Paul Park	67,100	89,220	32,000	23,000	—	—	23,500	23,000	24,500	75,500	8,300	—	14,000	—	—	—
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Company and location	Crude capacity b/d	Vacuum distillation b/d	Thermal operations	Charge capacity, b/d			Production capacity, b/d					
				— Cat. cracking — Fresh feed	Recycle	Cat. reforming	Cat. hydro- refining	Cat. hydro- treating	Alky- Poly- isomerization	Lubes	Asphalt	Hydrogen (MMcfd)
Koch Refining Co. — Rosemount	218,500	230,000	160,000	58,000	55,000	1,000	26,000	63,500	8,500	35,000	20.0	2,800
					16,000				11,000			
							46,000		13,700			
Total	285,600	299,220	192,000	58,000	55,500	1,000	127,000	86,500	19,150	49,000	20.0	2,800
MISSISSIPPI												
Amerada-Hess Corp. — Purvis	30,000	31,579	20,000	8,000	5,800		5,800		3,500			250
Chevron U.S.A. Inc. — Pascagoula	295,000	310,000	243,000	75,000	90,000		96,000	96,000	16,200	20,000	215.0	4,000
					68,000		83,000		5,500			
							30,000					
Ergon Refining Inc. — Vicksburg	16,800	18,300	12,000					3,800		3,600	2.5	
Southland Oil Co. — Lumberton	5,800	6,500								12,000	3.500	
Sandersville	11,000	12,500								5,100		
Total	358,600	378,879	275,000	83,000	95,800	1,000	59,800	192,800	19,700	40,600	217.5	4,250
MONTANA												
Cenex—Laurel ¹	40,400	42,500	14,000		12,000	3,000	12,000	14,000	3,000	6,000		
Conoco Inc. — Billings ²	49,500	52,000	20,000		19,000	1,000	14,700		6,000	6,500		
							4,500		3,800			
Exxon Co. — Billings	42,000	44,000	18,000	7,700	21,000	3,500	10,000	4,900	3,400	11,000	19.3	435
							10,000					
							6,000					
Montana Refining Co. — Great Falls	6,700	7,000	3,500		2,400	100	1,000		400			
							1,000					
							350					
Total	138,600	145,500	55,600	7,700	37,700	7,600	101,350	14,000	12,800	23,500	19.3	435
Solvent extraction: ¹ 4,000 b/d; ² 7,500 b/d (PDA)												
NEVADA												
Petro Source Refining Partners — Tonopah	4,500	4,700	2,500									
NEW JERSEY												
Amerada-Hess Corp. — Port Reading					50,000				4,500			
									5,000			
Chevron U.S.A. Inc. — Perth Amboy	80,000	85,000	46,000				25,000	4,000	9,300	35,000		
Coastal Eagle Point Oil Co. — Westville	109,250	115,000	45,000	10,000	50,000		14,000	2,500	12,000			
							17,000					
							4,800					
Exxon Co. — Linden	130,000	135,000	66,000		120,000	25,000	29,000	13,500	25,000	38,000		
							19,000					
							85,000					
Mobil Oil Corp. — Paulsboro ¹	100,000	107,000	64,200	21,000	36,000		11,500	6,500		8,500	11.0	1,100
							35,000					
							400					

Company and location	Crude capacity b/d	Charge capacity, b/d				Production capacity, b/d			
		Vacuum distillation	Thermal operations	— Cat. cracking — Fresh feed	Cat. hydro- reforming	Cat. hydro- refining	Alky. Poly.	Aromatics- isomerization	Asphalt
Seaview Petroleum Co. L.P. — Thorslare	75,000	30,000	—	—	—	—	—	—	—
Total	494,250	520,947	251,200	31,000	256,000	25,000	78,500	65,000	244,200
Solvent extraction: *9,500 b/d. †Cumene									
* Distillation									
NEW MEXICO									
Bloomfield Refining Co. — Bloomfield	16,800	18,107	—	—	6,000	500	4,000	—	—
Giant Industries Inc. — Gallup	20,000	21,000	7,900	—	7,800	3,000	6,800	—	—
Navejo Refining Co. — Artesia	38,000	40,000	6,000	—	20,000	2,000	8,000	—	—
Thriftway Marketing Corp. — Farmington	2,500	5,000	—	—	—	—	500	—	—
Total	77,300	84,107	13,900	—	33,800	5,500	19,800	500	30,300
NEW YORK									
Cobra Petroleum Products Co. — Albany	39,900	42,000	25,000	—	—	—	—	—	—
NORTH DAKOTA									
Amoco Oil Co. — Marsden	58,000	60,000	—	—	26,000	3,600	12,100	5,100	13,800
Total	58,000	60,000	—	—	26,000	3,600	12,100	5,100	13,800
OHIO									
Ashland Petroleum Co. — Canton	66,000	68,000	33,000	—	25,000	—	20,000	6,500	20,000
BP Oil Co. — Lima	142,500	150,000	41,000	18,000	34,000	—	55,000	24,000	60,000
Toledo	120,650	127,000	49,000	15,000	35,000	—	23,000	35,000	37,000
Sun Refining & Marketing Co. — Toledo	125,000	133,000	30,000	—	60,000	1,000	45,600	28,200	40,000
Total	454,150	478,000	153,000	33,000	174,000	1,000	162,600	87,200	170,500
Solvent extraction: *9,000 b/d									
OKLAHOMA									
Barrett Refining Corp. — Thomas	11,000	12,000	—	—	—	—	36,000	4,500	36,000
Conoco Inc. — Ponca City	140,000	145,000	45,000	20,500	53,000	—	30,000	2,100	30,000
Cyril Petrochemical Corp. — Cyril	12,500	13,160	—	—	—	—	1,800	—	1,800
Kerr-McGee Refining Corp. — Wynnewood	43,000	45,000	13,000	—	20,000	—	11,500	5,000	11,500
Sinclair Oil Corp. — Tulsa	50,000	52,632	26,500	—	18,000	5,000	12,000	6,000	12,000
Total	366,050	383,692	97,500	40,500	91,000	10,000	97,000	23,000	97,000
Solvent extraction: *9,000 b/d									
OKLAHOMA									
Barrett Refining Corp. — Thomas	11,000	12,000	—	—	—	—	36,000	4,500	36,000
Conoco Inc. — Ponca City	140,000	145,000	45,000	20,500	53,000	—	30,000	2,100	30,000
Cyril Petrochemical Corp. — Cyril	12,500	13,160	—	—	—	—	1,800	—	1,800
Kerr-McGee Refining Corp. — Wynnewood	43,000	45,000	13,000	—	20,000	—	11,500	5,000	11,500
Sinclair Oil Corp. — Tulsa	50,000	52,632	26,500	—	18,000	5,000	12,000	6,000	12,000
Total	366,050	383,692	97,500	40,500	91,000	10,000	97,000	23,000	97,000

Company and location	Crude capacity b/d	Change capacity, b/d			Thermal distillation operations	Charge capacity, b/d			Production capacity, b/d				
		— Cat. cracking — Fresh feed	Recycle	Cat. reforming		Cat. hydro- cracking	Cat. hydro- refining	Cat. hydro- treating	Alky. *Poly.	Aromatics- isomerization	Lubes	Asphalt	Hydrogen (Milsid)
Sun Refining & Marketing Co. — Tulsa ²	85,000	90,000	—	30,000	840	24,000	—	24,000 *10,500	27,000	2,200 2,200 2,000 3,000	8,000	4,600	300
Total Petroleum Inc. — Ardmore	68,000	70,000	—	25,000	—	—	25,000	24,000	27,000	—	—	—	—
Total	409,500	427,792	145,500	146,000	5,840	101,500	26,000	154,600	36,100	32,900	10,000	12,100	1,260

Solvent extraction: '5,000 b/d; '5,800 b/d

OREGON

Chevron U.S.A. Inc. — Portland

16,000

11,500

PENNSYLVANIA

BP Oil Co. — Marcus Hook

171,000 180,000 75,000

50,000 1,600 48,000 42,000

56,000 212,000

—

Chevron U.S.A. Inc. — Philadelphia

175,000 180,000 80,000

62,000 5,000 34,000

22,000 218,000

—

Pennzoil Products Co. — Rouseville

15,700 16,500 6,500

— 5,820

30,000 21,300

—

Sun Refining & Marketing Co. — Marcus Hook

170,000 185,000 46,000

87,000 39,600

54,300 12,000

—

Philadelphia

125,000 130,000 83,000

29,000 50,000

13,000 35,000

—

United Refining Co. — Warren

184,600 68,000 27,000

22,000 2,000 16,000

24,000 3,500

—

Wilco Chemical Co. — Bradford

10,000 11,500

— 1,650

6,000 2,000

—

Total

731,300 771,000 317,500

250,000 8,600 195,070

424,000 47,500

—

Solvent extraction: '730 b/d

TENNESSEE

Amoco Petroleum Inc. — Memphis

60,000 62,000 12,000

30,000 10,000

10,000 3,000

—

Total

60,000 62,000 12,000

30,000 10,000

31,000 5,500

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Champion Refining & Chemicals, Inc. — Corpus Christi

130,000 137,000 80,000

70,000 52,000

54,000 19,000

—

Chevron U.S.A. Inc. — El Paso

66,000 68,000 54,000

22,000 25,000

25,000 5,500

—

Total

433,000 460,000 195,000

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—

TEXAS

Amoco Oil Co. — Texas City

433,000 460,000 195,000

200,000 43,000 160,000

140,000 22,000

—

Company and location	Crude capacity bbl/d	Vacuum distillation bbl/d	Thermal operations	Charge capacity, bbl/d			Cat. hydro- refining	Cat. hydro- cracking	Cat. hydro- treating	Production capacity, bbl/d			
				— Cat. cracking — Fresh feed	Recycle	Refining				Alky. Poly.	Aromatics- isomerization	Lubes	Asphalt
Port Arthur	315,900	324,500	156,000	34,000	110,000	6,000	23,000	44,100	47,100	16,900	11,400	10,000	1,840
Coastal Refining & Marketing Inc. — Corpus Christi	90,250	95,000	53,000	11,000	18,500	—	21,000	17,500	20,000	3,200	17,500	—	650
Crown Central Petroleum Corp. — Houston	100,000	105,000	40,000	12,500	56,000	—	14,000	10,000	20,000	3,000	27,000	—	350
Diamond Shamrock Corp. — Sunray	111,000	115,000	47,000	—	45,000	—	15,000	20,000	33,000	8,700	5,000	—	—
Three Rivers ²	53,000	55,000	20,000	—	20,000	—	11,000	—	11,000	4,600	—	1,600	—
El Paso Refining Co. Ltd. — El Paso	26,000	27,500	—	—	10,800	—	7,400	—	7,400	3,000	700	—	120
Exxon Co. U.S.A. — Baytown ³	426,000	448,000	219,000	28,000	180,000	15,000	60,000	20,000	139,000	29,000	—	31,200	85.0
Fina Oil & Chemical Co. — Big Spring ⁴	55,000	60,000	24,000	—	22,000	—	20,000	—	25,000	5,000	1,000	—	—
Port Arthur ⁵	110,000	115,000	50,000	—	36,000	—	34,000	—	40,000	5,500	10,000	—	—
Hill Petroleum Co. — Houston ⁶	67,000	71,000	39,000	—	61,000	—	13,500	—	23,000	4,000	2,000	—	—
Texas City	123,500	130,700	64,000	—	50,000	—	11,000	—	23,000	6,000	—	—	—
Howell Hydrocarbons Inc. — San Antonio	2,900	2,900	—	—	—	—	12,000	—	29,000	—	1,000	—	—
Koch Refining Co. — Corpus Christi	125,000	130,000	42,000	—	40,000	800	15,000	—	49,500	8,400	7,600	—	375
LaGloria Oil & Gas Co. — Tyler	49,500	53,000	16,000	—	17,000	850	33,500	—	33,500	8,000	3,200	—	250
Leisl Petroleum Corp. — Nacogdoches	12,000	17,500	—	—	—	—	11,700	—	7,000	—	5,000	—	—
Liquid Energy Corp. — Bridgeport	10,000	10,800	—	—	—	—	—	—	—	—	—	—	—
Lyonell Petrochemical Co. — Houston ⁷ (49.9% ARCO)	265,000	286,000	129,000	40,000	90,000	—	110,000	—	110,000	14,000	11,000	6,000	2,650
Marathon Petroleum Co. — Texas City	69,500	72,000	27,000	—	38,000	1,000	10,500	—	92,000	11,000	2,500	—	—
Mobil Oil Corp. — Beaumont	275,000	290,000	86,000	29,500	102,000	—	57,000	32,000	116,000	13,000	20,000	9,400	1,471
Phillips 66 Co. — Borger	105,000	110,000	—	—	60,000	10,400	26,000	—	26,500	21,400	3,060	—	50.0
Sweeny	175,000	195,000	83,000	—	87,000	12,000	36,000	—	53,000	15,000	5,575	—	80.0
Pride Refining Inc. — Abilene	45,500	46,500	12,000	—	65,000	5,000	20,000	65,000	65,000	8,100	19,500	12,500	5,400
Shell Oil Co. — Deer Park	215,900	227,000	87,500	55,000	117,000	—	43,000	—	37,500	—	7,000	—	85.0

Company and location	Crude capacity b/d	Vacuum distillation b/d	Thermal operations	Charge capacity, b/d			Cat. hydro- treating	Alky. -Poly.	Aromatics- isomerization	Production capacity, b/d		
				— Cat. cracking — Fresh feed	Recycle	Cat. reforming				Lubes	Asphalt	Hydrogen (liticid)
Odessa	28,600	28,500	—	'10,500	—	'210,000	'11,000	'3,300	'350	—	—	—
Southwestern Refining Co., Inc. — Corpus Christi	104,000	108,000	36,000	'50,000	—	'30,000	'40,000	'7,500	'6,500	—	—	—
Star Enterprise — Port Arthur	250,000	273,000	138,000	'110,000	31,500	'46,000	'43,000	'16,200	—	18,700	14,000	—
Trifinity — Corpus Christi	18,000	20,000	20,000	—	—	—	'62,000	'9,500	—	—	—	'64.0
Valero Refining Co. — Corpus Christi	25,000	27,000	24,000	'65,000	—	—	—	—	—	—	—	—
Total	3,882,550	4,109,900	331,800	1,635,800	125,550	1,140,400	282,000	323,400	310,375	88,800	49,900	623.0

Solvent extraction: '15,000 b/d. '6,000 b/d. '53,000 b/d. '10,000 b/d. '18,000 b/d. '17,000 b/d. '6,000 b/d.
 Heavy oil cracker.

UTAH

Amoco Oil Co. — Salt Lake City	40,000	41,500	—	'18,000	4,000	'7,600	'7,600	'4,000	'3,000	—	—	—
Big West Oil Co. — Salt Lake City	24,000	25,000	3,800	'25,000	1,000	'5,000	'6,000	'1,500	'1,700	—	—	—
Chevron U.S.A. — Salt Lake City	45,000	46,000	35,500	'11,000	1,000	'7,500	'7,500	'4,300	'1,100	—	—	350
Crysen Refining Inc. — Woods Cross	12,500	13,400	4,000	—	—	'3,000	'2,000	'2,600	—	—	—	—
Pennzoil Products Co. — Roosevelt	8,000	8,500	—	'6,000	500	'2,000	'11,000	'2,100	'2,600	—	1,700	—
Phillips 66 Co. — Woods Cross	25,000	26,000	4,800	'8,400	2,600	'6,000	'7,100	'14,500	8,400	—	1,700	—
Total	154,500	160,400	48,100	55,400	9,100	31,100	7,100	34,100	8,400	—	1,700	350

Solvent extraction: '5,000 b/d.

VIRGINIA

Amoco Oil Co. — Yorktown	53,000	56,000	29,000	'14,000	2,000	'410,200	'10,500	—	—	—	—	750
Total	53,000	56,000	29,000	14,000	2,000	10,200	26,500	—	—	—	—	750

WASHINGTON

Atlantic Richfield Co. — Ferndale	187,000	176,000	95,000	'50,000	—	'56,000	'38,000	—	—	—	—	'90.0
BP Oil Co. — Ferndale	'90,250	95,000	35,000	'28,500	—	'16,500	'17,000	'6,000	—	—	5,000	—
Chevron U.S.A. Inc. — Seattle	—	—	6,000	—	—	—	'15,000	'900	'2,750	—	—	—
Shell Oil Co. — Anacortes	89,300	92,500	44,000	'42,000	3,000	'26,000	'32,000	'11,000	—	—	3,000	—
Sound Refining Inc. — Tacoma	11,900	12,754	6,000	—	—	—	'26,000	'10,000	—	—	—	—
Texaco Refining & Marketing Inc. — Anacortes	130,000	133,000	50,000	'48,000	4,000	'18,000	'13,000	'2,200	—	—	—	1,200
U.S. Oil & Refining Co. — Tacoma	'32,775	34,500	19,500	—	—	'6,000	'22,000	'6,000	'1,500	—	8,000	—
Total	\$21,225	\$43,794	265,500	118,500	7,000	128,500	52,000	30,100	4,250	16,000	80.0	3,700

Solvent extraction: '4,500 b/d.

Company and location	Crude capacity b/d	Vacuum distillation operations	Thermal operations	Change capacity, b/d		Cat. hydro- cracking	Cat. hydro- refining	Cat. hydro- treating	Alky. *Poly. isomerization	Production capacity, b/d			Hydrogen (Mscfd)	Coke (b/d)
				— Cat. cracking — Fresh feed	Recycle					Lubes	Asphalt			
WEST VIRGINIA														
Phoenix Refining Co.— St. Mary's	19,180	2,000	.....	.....	.....	1,500	.....	.....	.....	.....	2,000	.....	1.5	.....
Quaker State Oil Refining Corp.— Newell	10,500	8,850	.....	.....	.....	3,400	14,500	3,900	.....	.....	4,440	.....	1.2	.....
Total	29,680	10,850	.....	.....	.....	4,900	4,500	3,900	.....	.....	6,440	.....	2.7	.....
Solvent extraction: 1,000 b/d.														
WISCONSIN														
Murphy Oil USA Inc.—Superior	32,000	20,500	.....	11,000	1,000	8,000	5,800	9,000	2,000	.....	.....	13,500	.....	.....
WYOMING														
Amoco Oil Co.—Casper	40,000	14,000	.....	13,500	3,000	7,100	.....	17,300	2,500	.....	.....	550	.....	.....
Frontier Oil & Refining Co.—Cheyenne	36,100	20,000	8,000	11,500	500	6,600	8,000	27,200	23,000	.....	.....	10,000	.....	.....
Little America Refining Co.—Casper	22,000	8,600	.....	14,000	3,000	6,000	.....	16,000	.....	.....	.....	1,000	.....	.....
Sinclair Oil Corp.—Sindlar	54,000	30,000	.....	21,000	1,000	14,500	21,000	34,000	3,500	.....	.....	5,000	.....	.....
Wyoming Refining Co.—Newcastle	12,500	.....	.....	4,000	3,000	2,750	.....	12,000	700	.....	.....	.....	.....	.....
Total	184,600	72,600	8,000	64,000	10,500	36,950	29,000	54,750	10,500	2,500	.....	16,550	.....	.....

WORLDWIDE GAS PROCESSING

Capacities as of January 1, 1991, and average production

Country	No. plants	MMcfd		Production 1,000 gpd (Average based on the past 12 months)									Total products
		Gas capacity	Gas throughput	Ethane	Prop.	Isobut.	Process or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gas.	Other		
United States													
Alabama.....	7	255.0	204.6	.....	158.5	.....	134.8	6.4	38.3	117.1	504.0	959.1	
Alaska.....	4	5,773.5	5,701.0	.....	2.6	.....	16.5	.....	2,720.1	.....	.....	2,739.2	
Arkansas.....	5	938.0	581.2	0.5	7.4	1.7	7.1	.....	39.5	16.1	3.3	75.6	
California.....	32	1,090.7	666.6	.....	402.7	65.3	190.0	70.7	303.5	100.4	11.4	1,144.0	
Colorado.....	43	1,095.5	692.6	62.5	239.4	15.4	83.2	54.9	702.6	53.1	16.1	1,227.2	
Florida.....	2	890.0	749.8	51.0	103.7	22.0	67.3	.....	.....	66.3	.....	310.3	
Kansas.....	23	5,191.0	3,627.4	360.2	929.7	95.5	383.5	.....	840.4	286.0	1.9	2,897.2	
Kentucky.....	2	71.0	69.8	.....	.....	.....	.....	.....	163.3	.....	.....	163.3	
Louisiana.....	75	18,666.0	11,367.0	1,457.6	1,249.5	426.5	434.1	35.5	5,392.8	699.5	136.9	9,832.4	
Michigan.....	26	4,757.3	1,422.1	.....	67.7	.....	.....	6.3	559.5	12.7	18.6	664.8	
Mississippi.....	6	898.2	267.0	.....	10.8	.....	8.1	.....	11.0	7.9	3.2	41.0	
Montana.....	7	28.0	10.3	.....	29.7	.....	8.6	7.4	7.9	8.1	1.4	63.1	
New Mexico.....	28	2,655.5	1,782.4	176.0	238.2	13.5	43.9	.....	4,802.1	60.3	15.8	5,349.8	
North Dakota.....	8	128.0	83.1	.....	169.4	.....	90.8	9.8	98.9	25.1	5.2	399.2	
Ohio.....	1	20.0	8.5	.....	.....	.....	.....	.....	6.4	.....	.....	6.4	
Oklahoma.....	101	4,678.0	2,827.7	820.2	813.6	109.6	286.3	119.3	5,121.5	326.2	216.9	7,813.6	
Pennsylvania.....	2	14.0	8.3	.....	4.7	.....	3.0	.....	.....	4.1	.....	11.8	
Texas.....	301	16,470.1	10,492.7	3,069.6	3,197.9	520.1	1,434.9	601.6	15,985.3	1,824.8	1,389.5	28,023.7	
Utah.....	12	522.5	292.3	.....	92.0	.....	30.7	.....	136.6	37.1	10.0	306.4	
West Virginia.....	7	397.5	300.9	204.4	125.6	20.3	38.7	88.2	268.6	.....	.....	745.8	
Wyoming.....	40	3,660.3	2,843.4	21.9	283.4	9.6	216.1	84.3	2,516.5	146.5	1,145.4	4,423.7	
Total U.S.....	734	68,200.1	43,998.7	6,223.9	8,126.5	1,299.5	3,477.6	1,084.4	39,714.8	3,791.3	3,479.6	67,197.6	
Abroad													
Abu Dhabi.....	6	1,719.0	1,269.0	.....	.....	.....	.....	.....	.....	546.0	.....	546.0	
Algeria.....	4	5,335.2	4,268.2	.....	.....	.....	.....	632.8	.....	.....	5,449.2	6,082.0	
Argentina.....	14	1,488.4	1,498.9	687.7	497.2	.....	334.8	.....	.....	319.8	0.8	1,840.3	
Australia.....	5	2,333.0	1,376.0	279.0	441.0	.....	249.0	610.3	.....	1,058.5	850.0	3,487.8	
Austria.....	1	17.5	13.7	.....	.....	.....	.....	26.7	.....	28.4	.....	55.1	
Bahrain.....	1	168.0	155.0	.....	.....	.....	.....	25.6	.....	.....	.....	25.6	
Bangladesh.....	2	240.0	178.0	.....	.....	.....	.....	.....	.....	.....	8.2	8.2	
Bolivia.....	2	474.0	177.3	.....	1.4	2.5	.....	161.7	.....	61.5	136.9	364.0	
Brazil.....	11	452.3	456.2	8.0	.....	.....	.....	313.0	.....	118.4	226.7	668.1	
Brunei.....	2	1,132.0	867.4	.....	7.9	.....	.....	.....	.....	265.0	.....	272.9	
Canada													
Alberta.....	493	23,462.0	14,668.5	6,499.2	3,263.2	1,043.6	704.8	1,608.2	4,034.3	3,939.6	541.7	21,634.6	
British Columbia.....	16	2,408.3	1,195.7	.....	149.1	.....	59.1	3.5	.....	22.2	.....	233.9	
Northwest Territories.....	2	219.9	28.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Saskatchewan.....	29	354.1	249.5	.....	11.9	.....	6.6	12.9	104.2	4.4	18.0	158.0	
Chile.....	2	470.0	423.0	.....	190.0	.....	120.0	.....	.....	106.0	.....	416.0	
China, Taiwan.....	4	271.0	110.2	9.4	22.0	.....	15.8	.....	7.0	11.4	.....	65.6	
Colombia.....	7	366.4	212.3	110.0	51.3	.....	54.9	46.3	.....	63.7	1.0	327.2	
Denmark.....	1	450.0	240.0	.....	.....	.....	.....	.....	.....	.....	100.0	100.0	
Dubai.....	1	330.0	330.0	.....	.....	.....	.....	.....	.....	.....	650.5	650.5	
Ecuador.....	2	41.0	20.5	.....	.....	.....	.....	97.1	.....	37.3	.....	134.4	
Egypt.....	8	1,323.0	1,236.0	.....	.....	.....	.....	715.0	.....	.....	1,215.4	1,930.4	
France.....	1	570.0	563.0	.....	139.0	.....	132.0	.....	.....	270.0	.....	541.0	
Germany.....	3	366.0	274.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Greece.....	2	40.0	29.7	.....	.....	.....	.....	.....	110.3	.....	.....	110.3	
Hungary.....	12	1,097.2	475.3	.....	65.7	6.3	70.0	.....	367.4	819.2	103.6	1,432.2	
Indonesia.....	10	3,905.0	3,498.2	17.3	329.0	113.4	0.9	51.6	1,277.2	.....	32.6	1,822.0	
Italy.....	17	7,614.0	1,587.0	.....	.....	.....	.....	2.7	8.0	7.5	.....	16.2	
Kuwait.....	3	1,815.0	1,452.0	.....	1,722.0	.....	980.0	.....	.....	811.8	.....	3,513.8	
Libya.....	7	1,851.0	1,227.0	.....	.....	.....	37.8	5,577.0	.....	.....	551.0	6,165.8	
Malaysia.....	2	282.0	105.0	161.4	23.2	136.3	28.2	.....	.....	154.1	.....	503.2	
Mexico.....	11	4,649.0	3,561.1	15,174.0	.....	.....	.....	.....	.....	.....	15.2	15,189.2	
Netherlands.....	1	440.0	145.0	.....	.....	.....	.....	.....	.....	.....	6.1	6.1	
New Zealand.....	6	1,444.0	626.0	.....	39.1	.....	1.8	134.7	.....	18.6	733.7	927.9	
Norway.....	2	950.0	537.0	.....	682.0	108.0	256.0	.....	292.0	193.0	.....	1,531.0	
Oman.....	8	626.0	309.4	.....	.....	.....	.....	.....	202.0	43.0	.....	245.0	
Pakistan.....	6	1,275.0	976.7	.....	.....	.....	.....	53.8	64.9	.....	9.1	127.8	
Peru.....	2	70.0	37.0	.....	3.4	.....	1.0	5.6	28.9	.....	4.0	42.9	
Qatar.....	2	579.0	291.0	.....	506.0	288.0	.....	.....	.....	199.0	.....	993.0	
Saudi Arabia.....	5	4,300.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Sharjah, U.A.E.....	2	940.0	768.0	.....	287.0	.....	206.0	.....	.....	.....	1,164.0	1,657.0	
Spain.....	3	428.0	177.0	.....	.....	.....	.....	.....	.....	.....	73.0	73.0	
Thailand.....	2	850.0	550.0	.....	.....	.....	.....	400.4	8.4	84.0	.....	492.8	
United Kingdom.....	10	7,910.0	979.2	.....	332.0	.....	291.0	.....	.....	1,748.5	49.1	2,420.6	
Venezuela.....	14	2,913.0	2,557.0	213.3	197.4	.....	113.4	231.3	3,274.6	171.9	.....	4,201.9	
Yemen.....	1	400.0	443.0	.....	.....	.....	.....	53.6	305.5	.....	.....	359.1	
Total, outside U.S.....	745	86,369.3	50,144.3	23,159.3	8,960.8	1,698.1	3,625.3	5,224.6	15,661.7	11,102.8	11,941.8	81,374.4	
World Total.....	1,479	156,569.4	94,143.0	29,383.2	17,087.3	2,997.6	7,102.9	6,309.0	55,376.5	14,894.1	15,421.4	148,572.0	

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/conditioning method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
ALABAMA											
Collet Ventures Inc.—Copeland Washington Co.	12.0	6.0	¹² 5-7					6.4		16.6	
Exxon Co. U.S.A.—Big Escambia Creek, Escambia Co., 4-1n-7e	40.0	30.8	6-7		41.8		36.9			34.1	
Four Star Oil & Gas, Division of Texaco Inc.—Hatter's Pond, Mobile Co., 10-2s-1w	35.0	52.0	3		63.0		56.0			37.8	¹¹ 504.0
Freeport-McMoran Oil & Gas Co.—Womack Hill, Choctaw Co., 9-10n-2w	4.0	1.7	3		4.7		4.7			3.0	
Mobil Oil Exploration & Producing Southeast Inc.—Mary Ann, Mobile Co., 34-75-2w	80.0	35.4	¹¹ 1								
Phillips Petroleum Co.—Chatom, Washington Co., n-4-29-6n-4w	27.0	29.7	3						38.3		
Unocal—Chunchula, Mobile Co., 22-1s-2w	57.0	49.0	3		49.0		37.2			25.6	
Total	255.0	204.6			158.5		134.8	6.4	38.3	117.1	504.0
ALASKA											
Arco Alaska Inc.—*Prudhoe Bay Lisburne Production Center, 11n-15e-19	5,000.0	5,000.0	3						2,520.0		
*Swanson River LTS, Kenai Borough, 4-7n-9w	460.0	400.0	3						200.0		
Unocal—Grande Point, Kenai Peninsula, 26-11n-12w	310.0	300.0	3		2.6		16.5				
	3.5	1.0	3						0.1		
Total	5,773.5	5,701.0			2.6		16.5		2,720.1		
ARKANSAS											
Amoco Production Co.—Chalybeat Springs, Columbia Co., 34-19s-19w	28.0	23.1	7						18.3		
ARCO Oil & Gas Co.—Magnolia, Columbia Co., n-20-w 1-17-s	5.0	2.0	3	0.2	1.6	0.5	1.2			1.5	¹¹ 0.3

Gas Processing Survey

To arrive at more accurate totals, natural-gas throughput and liquids production are estimated at 80% capacity in those cases where only capacities are available. This explains apparent discrepancies in the addition of some columns.

The letters NR mean no response.

*Indicates cycling operations.

The symbol < denotes less than 100 gal/day.

The process/conditioning methods in the third column are identified by the following numbers:

- 1—absorption
- 2—refrigerated absorption
- 3—refrigeration
- 4—compression
- 5—adsorption
- 6—cryogenic-Joule-Thomson
- 7—cryogenic-expander
- 8—stabilization

Agents used in processes 1, 2, and 5 are indicated by superscripts as follows:

- ¹absorption oil
- ²activated alumina
- ³amine
- ⁴anhydrous ammonia
- ⁵Asorbail
- ⁶coal
- ⁷DEA
- ⁸desiccant
- ⁹DGA

- ¹⁰diesel-No. 1
- ¹¹ep naphtha
- ¹²freon
- ¹³glycol
- ¹⁴hot potassium carbonate
- ¹⁵iron sponge
- ¹⁶Jet A
- ¹⁷kerosine
- ¹⁸kero-propane
- ¹⁹lean oil
- ²⁰MDEA
- ²¹Mea
- ²²mineral seal oil
- ²³mole sieve
- ²⁴naphtha
- ²⁵natural gasoline
- ²⁶propane
- ²⁷Purisol
- ²⁸Q-Sol
- ²⁹Selexol
- ³⁰Sepasolv
- ³¹silica gel
- ³²Sorbead
- ³³Sulfinol
- ³⁴Sulphalene
- ³⁵TEG
- ³⁶Varsol
- ³⁷mw100
- ³⁸mw110
- ³⁹mw115
- ⁴⁰mw120
- ⁴¹mw125
- ⁴²mw127
- ⁴³mw130

- ⁴⁴mw131
- ⁴⁵mw133
- ⁴⁶mw140
- ⁴⁷mw145
- ⁴⁸mw150
- ⁴⁹mw160
- ⁵⁰mw175

Products listed in the last column are identified by numbers:

- 1—iso-pentane
- 2—upgraded motor fuel
- 3—diesel
- 4—kerosine
- 5—ethane-propane mix
- 6—solvent naphtha
- 7—jet fuel
- 8—normal pentane
- 9—residuum, bottoms
- 10—distillate, fuel oil
- 11—condensate
- 12—gas oil.

Figures in parentheses do not represent primary production, and are not added in state totals.

Since this compilation includes cycling plants reprocessing pipeline gas, totals shown here for gas throughput do not relate directly to government data on total gas processed, or sold. Similarly, liquids production figures are based on yearly average and do not necessarily reconcile with government data.

Company, plant, location	MMbbl			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Associated Natural Gas Inc.—Walker Creek, Columbia Co., 24-19s-23w	30.0	29.0	2	0.3	2.8	1.2	1.9	.....	.....	8.6	.....
Natural Gas Pipeline Co. of America—DP 370, White County, 29-7n-7w	850.0	505.0	3	.....	.....	.....	.....	.....	21.2	.....	.....
Oxy NGL Inc.—Walker Creek, Columbia Co., 23-19s-23w	25.0	22.1	2	.....	3.0	.....	4.0	.....	.....	6.0	113.0
Total	938.0	581.2		0.5	7.4	1.7	7.1	.....	39.5	16.1	3.3

CALIFORNIA

ARCO Oil & Gas Co.—No. Coles Levee No. 8, Kern Co., 32-30s-25e MDB&M	20.0	19.0	¹⁹ 2	.....	28.3	6.2	14.5	.....	.....	16.9	.....
Ojai Timber No. 18, Ventura Co., Rancho Ojai 36	3.0	2.2	3	.....	.....	.....	.....	.....	.....	.....	.....
Chevron U.S.A. Inc.—Carpinteria, Santa Barbara Co., 33-4n-25w	30.0	16.4	3	.....	0.6	.....	3.2	.....	.....	3.9	.....
Huntington Beach, Orange Co., 3-6s-11w	3.5	1.8	3	.....	.....	.....	.....	.....	2.7	.....	.....
Inglewood LTS, Los Angeles Co., 8-25-4w	15.0	5.8	3	.....	.....	.....	.....	.....	12.8	.....	.....
Kettleman 3-P, Kings Co., 3-22s-17e	10.0	4.7	3	.....	.....	.....	.....	.....	6.4	.....	.....
McKittrick Seventeen-Z, Kern Co., 17-30s-22e	80.0	47.3	¹⁹ 2	.....	35.6	.....	.....	.....	40.8	.....	.....
Murphy-Coyote, Orange Co., 18-3s-10w	5.0	1.0	3	.....	.....	.....	.....	.....	1.3	.....	.....
Race Track 32-Z, Kern Co., 32-30s-29e	7.0	0.3	3	.....	.....	.....	.....	.....	0.2	.....	.....
Taft 1-C LTS, Kern Co., 1-32s-23e	16.0	9.5	3	.....	1.3	.....	3.8	.....	.....	11.3	.....
Torrance, Los Angeles Co., 24-4s-14w	3.0	0.6	3	.....	.....	.....	.....	.....	0.8	.....	.....
Department of Energy—35R Loop, Kern Co., 30s-23s-35R	94.0	59.2	¹⁹ 1	.....	38.0	30.0	28.1	.....	29.5	.....	.....
LTS-1, Kern Co., 30s-23s-35R	140.0	129.8	3	.....	80.0	.....	57.0	.....	71.2	.....	.....
LTS-2, Kern Co., 30s-23s-35R	140.0	129.8	3	.....	66.8	.....	41.6	.....	61.3	.....	.....
Four Star Oil & Gas, Division of Texaco Inc.—Lost Hills, Kern Co., 9-27s-21e	60.0	23.4	3	.....	12.5	.....	.....	.....	26.0	.....	.....
Lomita Gasoline Co.—Harbor, Los Angeles Co.	60.0	10.0	4	.....	.....	.....	.....	.....	4.0	.....	.....
Signal Hill, Los Angeles Co.	20.0	5.0	3.4	.....	2.1	.....	.....	.....	16.0	.....	.....
Marathon Oil Co.—South Coles Levee, Kern Co., 3-31s-25e	80.0	35.7	1- ¹⁵	.....	17.4	2.6	5.5	.....	.....	12.4	.....
Mobil Oil Corp.—Rincon, Ventura Co., 7-3n-24w SBB&M	20.0	8.0	3	.....	.....	.....	.....	.....	.....	.....	¹¹ 11.0
Shell Western E&P Inc.—Clark Ave., Santa Barbara Co., 9-9n-33w	3.6	0.0	3	.....	.....	.....	.....	.....	.....	.....	.....
Huntington Beach, Orange Co., 3-6s-11w	15.0	2.5	3	.....	.....	.....	.....	.....	.....	.....	.....
Kernridge, Kern Co., 32-28s-1e	60.0	51.7	2	.....	28.4	20.5	.....	58.6	.....	.....	.....
Texaco Exploration & Production Inc.—Buena Vista Hills, Kern Co., 8-32s-24e MDB&M	20.0	3.8	¹⁹ 1	.....	3.4	.....	.....	.....	5.5	.....	.....
Cymric, Kern Co., 26-29s-22e MDB&M	2.0	0.8	3	.....	.....	.....	.....	.....	0.9	.....	.....
Shells Canyon, Ventura Co., 4-4n-19w SBB&M	18.0	5.8	¹⁹ 2	.....	5.1	.....	4.1	.....	.....	6.3	.....
Ventura Co., 27-3n-23w SBB&M	20.0	14.6	¹⁹ 2	.....	25.0	6.0	11.2	.....	.....	11.5	.....
Unocal—Battles, Santa Barbara Co., 24-10n-34w SBB&M	35.0	8.5	¹⁹ 1	.....	19.0	.....	14.2	.....	.....	11.0	.....
Bell, Los Angeles Co., 6-3s-11w, SBB&M	0.6	0.4	4	.....	.....	.....	.....	.....	.....	.....	¹¹ 0.4
Coalinga Nose, Fresno Co., 7-20s-16e, SBB&M	70.0	52.5	7	.....	32.6	.....	6.8	.....	.....	21.7	.....
Dominguez, Los Angeles Co., 33-3s-9w SBB&M	3.0	1.6	2	.....	.....	.....	.....	.....	3.4	.....	.....
Santa Clara Valley, Ventura Co., 31-4n-18w, SBB&M	17.0	8.5	7	.....	.....	.....	12.1	.....	.....	5.4	.....
Stearns, Orange Co., 7-3s-9w SBB&M	20.0	6.1	¹⁹ 1	.....	6.6	.....	.....	.....	20.7	.....	.....
Total	1,090.7	666.6		.....	402.7	65.3	190.0	70.7	303.5	190.4	11.4

COLORADO

Amoco Production Co.—Spindle, Weld Co., 34-2n-67w	37.0	18.1	7	.....	.....	.....	.....	.....	85.5	.....	¹¹ 3.9
Wattenberg, Adams Co., 32-3s-65w	150.0	88.0	7	.....	.....	.....	.....	.....	226.9	.....	.....
Associated Natural Gas Inc.—Eaton, Weld Co., se 34-7n-66w	15.0	7.5	3	10.8	10.7	0.1	5.0	.....	.....	3.9	.....
Greeley, Weld Co., sw 25-5n-66w	30.0	20.4	6	19.5	21.8	4.3	10.0	.....	.....	9.2	.....
Kersey, Weld Co., se 35-4n-66w	35.0	29.5	3-6	20.6	26.7	8.4	19.5	.....	.....	4.4	.....
Lucerne, Weld Co., se 28-6n-65w	15.0	10.5	6	11.6	12.7	2.6	6.1	.....	.....	4.3	.....
Cabin Creek Gas—Cabin Creek, Adams Co., sw 4 nw 4 31-3s-59w 6th PM	1.5	0.1	3	.....	.....	.....	.....	.....	1.6	.....	.....
Casco Inc.—Black Sulfur Creek, Rio Blanco Co., 20-2s-97w	4.0	0.5	3	.....	.....	.....	.....	.....	.....	.....	.....
Colbran, Mesa Co., 35-9s-95w	4.0	1.4	3	.....	.....	.....	.....	.....	0.4	.....	.....
Debeque, Garfield Co., 6-8s-97w	15.0	0.0	3	.....	.....	.....	.....	.....	.....	.....	.....
Piceance, Rio Blanco Co., 22-1n-97w	8.0	2.7	3	.....	.....	.....	.....	.....	1.3	.....	.....
Slick Rock, San Miguel Co., 30-44n-18w	8.0	2.7	3	.....	.....	.....	.....	.....	1.3	.....	.....
South Canyon, Garfield Co., 3-8s-104w	15.0	4.2	3	.....	.....	.....	.....	.....	0.5	.....	.....
Celsius Energy Co.—Dove Creek, Dolores Co., 5-40n-18w	10.0	2.0	3	.....	.....	.....	.....	.....	0.3	.....	.....
Cuthroat 'A', Montezuma Co., 10-37n-19w	1.5	1.2	3	.....	.....	.....	.....	.....	6.0	.....	.....
Cuthroat 'B', Montezuma Co., 26-37n-19w	1.5	1.2	3	.....	.....	.....	.....	.....	8.0	.....	.....
Chevron U.S.A. Inc.—Rangely CO ₂ , Rio Blanco, 32-2n-102w	60.0	60.0	3	.....	.....	.....	.....	.....	50.4	.....	¹¹ 8.4
Conoco Inc.—Dragon Trail, 35, 12s-102w	56.0	30.0	¹⁹ 2-3	.....	20.0	.....	30.0	.....	.....	.....	.....
Coors Energy Co.—Wattenberg, Weld Co., 25-1n-66w	10.0	4.5	3	.....	.....	.....	.....	.....	6.2	.....	.....
Enron Gas Processing Co.—Greeley, Weld Co., sw 25-5n-6w	5.5	1.8	3	.....	2.0	.....	.....	.....	2.2	.....	¹¹ 0.2
Four H Partnership—Piceance Creek, Rio Blanco Co., 15-25-96w (25 miles se of Rangely)	40.0	15.0	¹⁹ 2	.....	.....	.....	.....	.....	.....	.....	.....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Freeport McMoran Oil & Gas Co.—Yenter, Logan Co., nw/4 2-8n-54w	5.0	3.5	3						13.6		
Gary-Williams Energy Corp.—Running Creek, Elbert Co., 21-6s-64w	5.0	3.4	3						16.2		
Greeley Gas Co.—Clyde, Prowers Co., 19-23s-145w	5.0	2.5	3						2.0		
Koch Hydrocarbon Co.—Third Creek, Adams Co., 18-25-65w	25.0	17.7	8		19.4				57.9		113.5
Loveland Gas Processing Co. Ltd.—Loveland, Larimer Co., 15n, r68w	6.0	2.0	3		3.1					13.9	
Northwest Pipeline Corp.—Foundation Creek, Rio Blanco Co., 26-45n-102w	20.0	5.0	3						2.4		
Ignacio, La Plata Co., sw/4 36-34n-114w	300.0	242.0	7		58.2		42.6		85.4	27.4	
North Douglas Creek, Rio Blanco Co., 19-1s-167w	20.0	11.0	3						9.8		
Planet Engineer's Inc.—McClave, Kiowa Co., 32-20s-48w	7.5	4.1	1/2		5.9			4.4			
Roggen Gas Processing Co.—Roggen, Main, Weld Co., se/4 sw/4 24-2n-63w	31.0	26.8	7		56.2				42.5		
Vallery, Morgan Co., 15-3n-59w	1.5	0.8	3						3.0		
Texas Gas Corp.—Chalice, Arapahoe Co., 10-4s-64w	3.0	1.4	3					3.5			
Running Creek, Elbert Co., 21-6s-64w	5.0	3.4	3-6					17.0			
Texaco Exploration & Production Inc.—Wilson Creek, Rio Blanco Co., 27-3n-94w	2.0	1.3	3		2.7						
Texas Oil & Gas Corp.—Baca County, 11-33s-42w Grid 9	5.0	2.2	3						9.3		110.1
Union Pacific Resources—Bedsow Ranch, Cheyenne Co., 1-13s-51w	3.0	0.7	3						1.4		
*Frontiers, Cheyenne Co., 24-15s-41w	3.0	2.0	3						3.3		
*Mt. Pearl, Cheyenne Co., 35-13s-48w	10.0	6.0	3						11.6		
Vessels Gas Processing Ltd.—Ft. Lupton, Weld Co., se/4 28-1n-67w	45.0	30.0	3						50.0		
Vessels Oil & Gas Co.—Ft. Lupton, Fractionator, Weld Co., se/4 28-1n-67w	40.0	24.4		(39.0)	(27.0)		(32.0)			(32.0)	
Western Gas Processors Ltd.—Lanson Farms, Weld Co., nw/4 ne/4 35-2n-68w	1.5	0.1	3						1.5		
Williams Field Services Co.—Piceance Creek, Rio Blanco Co., 5s/8, 1-2-s, r-96-w	30.0	1.0	1/5						0.1		
Total	1,095.5	692.6		62.5	239.4	15.4	83.2	54.9	702.6	53.1	16.1

1Butane-gasoline mix.

FLORIDA

Enron Gas Processing Co.—Brooker, Bradford Co.	800.0	725.0	1/2		55.0	22.0	20.0			51.0	
Exxon Co. U.S.A.—Jay, Santa Rosa Co., 9 n43-5n-29w	90.0	24.0	6-7	51.0	48.7		47.3			15.3	
Total	890.0	749.0		51.0	103.7	22.0	67.3			66.3	

KANSAS

Amoco Production Co.—Ulysses, Grant Co., 5-29s-38w	400.0	44.0	1/2		0.3				36.9		
Anadarko Petroleum Corp.—Cimarron, Seward Co., 23-33s-32w	15.0	16.5	1/2		8.3				10.6		
Woods, Seward Co., 22-33s-34w	10.0	7.2	1/2		4.1				5.5		
Colorado Interstate Gas Co.—Lakin, Kearney Co., rd ne/4 29-24s-36w	250.0	82.0	1						18.2		
Morton Co. ne/4 ne/4 18-33s-43w	25.0	21.0	3						36.7		
Enron Gas Processing Co.—Bushton ethane, Ellsworth Co., 31-17s-9e	500.0	364.0	7	358.0							
Bushton hydrocarbon, Ellsworth Co., 31-17s-9w	950.0	962.0	1/2		677.1	95.5	213.9			166.4	
Enron Helium Co.—Bushton, Ellsworth Co., 31-17s-19w	500.0	511.0	6								11.6
KN Energy Inc.—Scott City Helium, Scott Co., 17-18s-33w	75.0	62.0	3	2.2	33.8		18.5			4.3	
Scott City NGL, Scott Co., 17-18s-33w	150.0	99.8	1				2.0			12.8	
Massa Limited Partnership—Ulysses, Grant Co., 10-30s-37w	242.0	111.1	1/2						119.9		
Mobil Oil Corp.—Hickok, Grant Co., 31-28s-35w	210.0	102.0	4								
National Helium Corp.—Seward Co., 23-33s-32w	800.0	646.0	3		196.3		149.1			102.5	
Northern Natural Gas Co.—Holcomb, Finney Co., 3-24s-34w	200.0	181.4	5						42.1		
Oxy U.S.A. Inc.—Cheney, Kingman Co., ne/4 22-28s-5w	85.0	70.0	7						145.0		
Hutchinson, Reno Co., se/4 22-23s-6w			1	(110.9)	(540.4)	(117.0)	(308.4)			(240.7)	
Jayhawk, Grant Co., 2-29s-35w	550.0	247.0	6						333.0		
Kansas Gas Supply/Glick, Kiowa Co., 20-30s-15w	100.0	50.0	10/1								
Midway, Kingman Co., 33-27s-5w	30.0	23.0	2						37.6		
Spivey, Harper Co., 5-31s-8e	66.0	10.9	2						40.3		
Wilburton, Morton Co., 33-34s-41w	5.0	1.4	3						4.9		
Peoples Natural Gas Co.—Burton, Harvey Co., 21-23s-34w	3.0	1.2	3						0.5		
Texaco Exploration & Production Inc.—Minneola, Ford Co., 13-29s-25w	25.0	7.9	1/2		9.8				9.2		11<0.1
Total	5,191.0	3,627.4		360.2	929.7	95.5	383.5		640.4	286.0	1.8

1Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals) 2Helium—MMcfd.

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							Other
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	
KENTUCKY											
Kentucky Hydrocarbon—Dwale Cryogenic, Floyd Co.	20.0	16.0	3-7						29.1		
Maytown, Floyd Co.	51.0	53.8	3-6-7						134.2		
Total	71.0	69.8							163.3		
LOUISIANA											
Amoco Production Co.—West Hackberry											
Cameron Par., 19-12s-10w	2.0	0.6	7						0.6		
ARCO Oil & Gas Co.—Bayou Sale, St. Mary Par., 17-1LS-9e	97.0	22.6	1 ⁹ 2		4.5		2.5			3.0	
Arkia Inc.—Elm Grove, Bossier Par.	3.0	1.3	3						0.5		
Gayles, Caddo Par., 30-16n-12w	3.0	1.3	3						0.3		
Associated Natural Gas Inc.—Cadeville, Quachita Par., se25-17n-1e	2.0	0.6	3								
*Minden, Webster Par., s26-21n-910	100.0	60.4	1 ⁹ 2		33.9	15.4	14.7			19.1	
B.P. Exploration—Delhi, Richland Par., 15-17n-9e	22.0	15.8	6		2.7		2.6			9.1	
Bruin Petroleum Inc.—Port Hudson, East Baton Rouge, Par.	40.0	0.0	3								
Chevron U.S.A.—Krotz Springs, St. Landry Parish	100.0	4.35	1 ⁹ 1						12.0		
Judge Digby, W. Baton Rouge Parish	250.0	45.0	75								
Bergeron-Haydel, W. Baton Rouge Parish	20.0	4.5	75								
Claiborne Gasoline Co.—Lisbon, Claiborne Par., 20-21n-4w	75.0	48.7	1 ⁹ 2		27.0	12.7	16.3			29.7	
Coastal Oil & Gas Corp.—Pelican, St. Mary Par., 51&52 15s-11e	250.0	214.0	7						161.7		
Conoco Inc.—Acadia Par., 31-9s-1w	65.0	23.0	7	15.0	11.2	5.1	3.6		13.5		
Gillis, Calcasieu Par., se 1/4 sw 1/4 14-9s-8w	180.0	190.0	6-7	161.0	99.8	42.6	29.6		45.5		
Grand Chenier, Cameron Par., 2-39-40 15s-6w	950.0	300.0	1 ⁹ 2-7	178.0	96.5	41.5	26.6		35.4		
CSX NGL Corp.—Cow Island, Vermilion Par., 29-13s-2e	950.0	283.0	1 ⁹ 2						251.7		
Eunice, Acadia Par., sw 1/4 nw 1/4 12-7s-2w	1,350.0	992.0	1 ⁹ 2-7	254.4	202.0	69.3	57.6			136.0	
Riverside fractionation, Ascension Par., 8-10s-2e 46-9s-2e			†	(193.8)	(146.1)	(50.4)	(49.3)			(85.9)	
Davis, J.L.—White Castle, Iberville Par., 15-10s-13e	7.5		7								
Delhi Gas Pipeline Corp.—Ruston, Lincoln Par., ne 1/4 of nw 1/4 12-19n-4n	30.0	5.5	3						7.5		
Endevco Natural Gas Co.—Dubach, Lincoln Par.	90.0	25.0	3		45.0	12.7	15.5			37.8	
Calhoun	60.0	30.0	1 ⁹ 2				30.0				
Exxon Co. U.S.A.—Baton Rouge, West Baton Rouge Co., 7s-12e-58	225.0	172.9	6-7	52.5	35.1	12.1	10.9			26.4	
Bluewater, Acadia Par., 34-10s-1w	950.0	715.1	6-7	281.7	124.5	41.8	35.9			93.0	
*Garden City, St. Mary's Par., 45-46-15s-10e	600.0	193.2	2	75.6	75.4	23.2	19.8			34.9	
Grand Isle, Jefferson Par., 32-21s-25e	130.0	80.0	7						97.0		110.5
J.P. Oil Co.—Elba, St. Landry Par., 4s-7e	1.5	0.8	3						1.7		
Kerr-McGee Corp.—Bayou Crook Chene, St. Martinville Par., 34-10s-9e	12.5	NR	2						12.9		
Kinder Gas Processing Corp.—Kinder, Allen Par., 25-10s-9e	25.0	5.0	1 ⁹ 2		3.3		5.6			1.4	
LIG Liquids Corp.—Aymond, St. Mary Par., 13-14s-9e	40.0	7.1	7						8.7		
Gibson, Terrebonne Par., 77-16s-15e	90.0	60.2	7						85.2		
Plaquemine, Iberville Par., 46-10s-12e	225.0	123.4	7	102.2	66.5	24.3	26.1			44.5	
St. Landry, Evangeline Par., 35-2s-2e	80.0	75.3	1 ⁹ 2		20.7		21.2			14.5	
Marathon Oil Co.—Burns Point, St. Mary Par., 15-17s-9e	200.0	110.0	7						112.1		
Cotton Valley, Webster Par., 26-121n-10w	65.0	38.0	7	75.1	29.8	11.6	12.1			22.1	112.1
Theall Lex Unit, Vermilion Par., 36-2E-T11S	4.0	1.0	6								11.5
Onyx Energy Co.—Beaver Dam Creek, St. Helena Par.	1.5	0.3	3						1.2		
*Fordoche, Pointe Coupee Par., 41-6s-8e	35.0	27.8	7						27.3		
Maurice, Lafayette Par., 31-10s-4e	33.0	7.9	172						11.2		
South Sarepta, Bossier Par., 21-22n-11w	25.0	3.6	172						12.0		
Oxy U.S.A. Inc.—Cameron, Cameron Par., Tract 22 & 23, 15s-13w	310.0	321.0	7						249.7		
Lake Charles Fractionation, Calcasieu Par., 19-10s-9w			†	(525.0)	(323.5)	(118.7)	(97.6)			(187.0)	
Lowry, Cameron Par., 16-12s-4w	300.0	120.1	7						147.0		
Sea Robin II, Vermilion Par., 21-13s-4e	200.0	105.0	7						73.5		
Phillips, Jack L.—Oretta, Beauregard, Par.	2.0	0.5	3						0.8		
Phoenix Lake Corp.—Phoenix Lake, Calcasieu Par., R13w T11s	1.0	0.1	6				<0.1				
Resources Extraction & Processing Co.—Bayou, Vista 1, St. Mary Par., 11-15s-11e	200.0	200.0	7						200.0		
Shell Western E&P Inc.—Barracuda, Cameron Par., 24-15s-13w	195.0	124.5	7						163.2		
Calumet, St. Mary Par., 11, 12, 51, 52-15s-11e	1,200.0	898.6	2						394.9		
Norco fractionator, St. Charles Par., 6-12s-8e			†	(305.5)	(284.9)	(94.0)	(101.7)			(195.7)	
North Terrebonne, Terrebonne Par., 19,20,29,33-17s-15e	1,250.0	940.9	2						883.8		
Stingray, Cameron Par., 33&34-15s-13w	295.0	271.9	2						143.3		
Tebone fractionator, Ascension Par., 45&46-9s-2e			†	(195.8)	(278.3)	(79.0)	(82.3)			(160.4)	

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Toca, St. Bernard Par., 54-14s-14e.....	830.0	458.8	2-7	.....	.....	.....	.....	.....	383.4	.....	.....
Yscloskey, St. Bernard Par., 39-13s-15e.....	1,850.0	1,422.0	2	.....	.....	.....	.....	.....	848.3	.....	.....
Sid Richardson Carbon & Gasoline Co.— Hico-Knowles, Lincoln Par., 9 acres sw¼ of se¼10 & nw¼ of ne¼ 15-20n-3w.....	15.0	3.7	7	.....	.....	.....	.....	.....	4.1	.....	110.2
Tejas Gas Corp.—Lake LaRose, St. Martin Parish.....	16.0	4.3	7	.....	.....	.....	.....	5.4	.....	.....	.....
Tenneco Natural Gas Liquids Corp.— R.M. Stephens, Claiborne Par., 647-13s-12e	35.0	18.9	2	.....	16.7	.....	11.4	.....	.....	8.5	.....
Sabine Pass, Cameron Par., 20-15s-13w....	200.0	138.1	7	.....	.....	.....	.....	.....	160.3	.....	.....
Texaco Exploration & Production Inc.— Floodway, St. Mary Par., 16-16s-12e.....	600.0	157.7	6-7	.....	.....	.....	.....	.....	95.0	.....	.....
Henry, Vermilion Par., 21-13s-4e.....	803.0	601.0	372-6-7 432	188.0	112.0	35.6	30.3	.....	.....	75.4	.....
Paradis, St. Charles Par., 39-14s-20e.....	660.0	161.1	6-7	74.1	79.4	16.8	19.7	.....	.....	30.3	112.1
Sea Robin, Vermilion Par., 21-13s-4e.....	900.0	329.6	6-7	.....	.....	.....	.....	.....	283.9	.....	110.7
Texas Eastern Transmission Corp.— Iowa, Jefferson Davis Par., 18-9s-6w.....	500.0	370.0	6-7	.....	.....	.....	.....	.....	206.0	.....	.....
Pointe au Chien, Terrebonne Par., 18-19s-20e.....	125.0	71.0	7	.....	.....	.....	.....	.....	49.0	.....	.....
Torch Operating Co.—Patterson II, St. Mary Par., 48-15s-11e.....	400.0	140.0	7	.....	.....	.....	.....	.....	111.0	.....	.....
Union Texas Petroleum—Cox Bay, Plaque mine Par., 5-19s-16e.....	20.0	0.0	321	.....	.....	.....	.....	.....	.....	.....	.....
Pointe-a-la-Hache, Plaquemine Par., 78-13s-14e.....	20.0	9.3	322	.....	1.1	0.5	0.4	.....	.....	1.3	.....
Sligo, Bossier Par., 29-18n-11w.....	70.0	28.5	322	.....	10.3	2.5	3.7	.....	.....	7.4	.....
Toca, St. Bernard Par., 56-14s-14e.....	160.0	98.9	172	.....	39.1	15.0	16.5	.....	.....	31.4	.....
Warren Petroleum Co.—Krotz Springs, St. Landry Par., 22-6s-6e.....	NR	3.9	182	.....	113.0	43.8	51.5	.....	8.8	.....	119.7
Venice, Plaquemine Par., 25-21s-30e.....	NR	391.5	182	.....	.....	.....	.....	.....	.....	73.7	1108.4 113.7
Vermilion Par., s2 sw4 28-13s-2e.....	NR	53.0	7	.....	.....	.....	.....	.....	63.3	.....	.....
Williams Energy Co.—Crawfish, St. Charles Par., 36-13s-8e.....	120.0	36.7	7	.....	.....	.....	.....	.....	25.5	.....	.....
Total.....	18,666.0	11,367.0		1,457.6	1,249.5	426.5	434.1	35.5	5,392.8	699.5	136.9

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

MICHIGAN

Amoco Production Co.—Kalkaska Co., 31-27n-7w.....	180.0	120.5	7	.....	48.5	.....	.....	.....	77.2	.....	112.9
ANR Pipeline Co.—Austin dehydration, Mecosta Co., 4-14n-9w.....	500.0	103.0	325	.....	.....	.....	.....	.....	.....	.....	111.2
*Capac dehyd., St. Clair, 16-7n-13e.....	300.0	75.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*C. Charlton-1 sep., Otsego Co., 1-30n-1w.....	220.0	133.0	3	.....	.....	.....	.....	.....	.....	.....	115.6
*Coldwater dehyd., Isabella Co., 29-16n-6w.....	40.0	16.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*Croton dehyd., Newaygo Co., 29-12n-11w.....	50.0	12.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*Goodwell dehyd., Newaygo Co., 4-14n-11w.....	385.0	147.0	325	.....	.....	.....	.....	.....	.....	.....	110.7
*Lincoln dehyd., St. Clair Co., 20-18n-5w.....	300.0	103.0	325	.....	.....	.....	.....	.....	.....	.....	110.6
*Loreed, Osceola Co., 30-18n-10w.....	32.0	28.0	3	.....	.....	.....	.....	.....	1.3	.....	.....
*Loreed dehyd., Osceola Co., 30-18n-10w.....	1,000.0	107.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*Muttonville dehyd., Macomb Co., 13-4n-14e.....	450.0	89.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*North Hamilton dehyd., Clare Co., 6-19n-3w.....	40.0	7.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*Norwich dehyd., Newaygo Co., 4-14n-11w.....	50.0	30.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*Orient dehyd., Osceola Co., 13-17n-7w.....	50.0	18.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*Reed City dehyd., Osceola Co., 30-18n-10w.....	300.0	77.0	131	.....	.....	.....	.....	.....	.....	.....	.....
*South Chester-15 sep., Otsego Co., 15-29n-2w.....	270.0	115.0	3	.....	.....	.....	.....	.....	.....	.....	115.4
*Winfield dehyd., Montcalm Co., 7-12n-9w.....	100.0	42.0	131	.....	.....	.....	.....	.....	.....	.....	.....
Conoco Inc.—Aurelius, Ingham Co., 36-2n-2w.....	22.0	5.0	182	.....	6.4	.....	6.3	.....	.....	.....	111.3
Marathon Oil Co.—Scipio, Hillsdale Co., 10-5s-3w.....	38.0	4.1	182	.....	14.8	.....	.....	.....	.....	12.7	.....
Stoney Point, Hillsdale Co., 5-5s-2w.....	4.0	3.9	3	.....	.....	.....	.....	.....	7.4	.....	.....
West Branch, Ogemaw Co., 27-22n-2e.....	20.0	12.4	7	.....	.....	.....	.....	.....	23.4	.....	.....
Michigan Consolidated Gas Co.— Romeo, Macomb Co., 14-4n-12e.....	15.0	9.6	3	.....	.....	.....	.....	.....	8.5	.....	110.7
Oryx Energy Co.—Akron, Tuscola Co. Columbus III, Saint Clair Co., 3-5n-15e.....	9.8	1.5	3	.....	.....	.....	.....	.....	0.5	.....	.....
Mentor, Oscoda Co., 29-25n-3e.....	9.0	2.5	3	.....	.....	.....	.....	.....	6.6	.....	.....
Mt. Pleasant, Isabella Co., 2-14n-3w.....	9.5	7.9	.....	.....	.....	.....	.....	.....	6.8	.....	.....
Norwich, Missaukee Co., 12-24n-5w.....	3.0	0.5	3	.....	.....	.....	.....	.....	0.6	.....	.....
Norwich, Missaukee Co., 12-24n-5w.....	10.0	2.2	6	.....	.....	.....	.....	.....	7.8	.....	.....
Shell Western E&P Inc.— Kalkaska Co., 32-27n-7w.....	350.0	150.0	2	.....	.....	.....	.....	.....	419.4	.....	.....
Total.....	4,757.3	1,422.1		.....	67.7	.....	.....	6.3	559.5	12.7	16.6

MISSISSIPPI

Kerr-McGee Corp.—McComb, Amite Co., 21-4n-6e.....	2.0	NR	2	.....	.....	.....	.....	.....	1.0	.....	.....
Koch Hydrocarbon Co.—Harmony, Clarke Co., 5-5s-62w.....	30.0	5.6	3	.....	8.6	.....	7.2	.....	.....	6.0	113.2
Pronto Gas Co.— Laurel, Jones Co.....	1.2	0.7	3	.....	.....	.....	.....	.....	3.0	.....	.....
Shell Western E&P Inc.— Goodwater, Clarke Co., 5-10n-8w.....	15.0	5.6	3	.....	2.2	.....	0.9	.....	.....	1.9	.....
Thomasville, Rankin Co., 27-4n-3e.....	100.0	57.1	331	.....	.....	.....	.....	.....	.....	.....	.....
Southern Natural Gas Co.—Muldoo, Monroe Co., 27-15s-6e.....	750.0	198.0	65	.....	.....	.....	.....	.....	7.0	.....	.....
Total.....	898.2	267.0		.....	10.8	.....	8.1	.....	11.0	7.9	3.2

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)								Other
	Gas capacity	Gas through-put	Process/condition method	Ethane	Pro ¹	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.		
MONTANA												
Coastal Oil & Gas Corp.—Stateline, Richland Co., 7 22n-59e	12.0	2.0	3	.....	5.2	.....	.....	.....	4.7	.....	¹¹ 1.4	
Shell Western E&P Inc.—Cabin Creek, Fallon Co., 18-10n-58e	1.9	1.5	3	.....	2.4	.....	2.9	.....	.....	2.7	.....	
Little Beaver, Fallon Co., 8-4n-62e	0.4	0.3	3	.....	0.8	.....	0.5	.....	.....	0.5	.....	
South Pine, Wibaux Co., 10-11n-57e	1.2	0.8	3	.....	1.9	.....	1.7	.....	.....	1.6	.....	
True Oil Co.—Bob Rhodes, Richland Co., ne 4-25n-58e ...	4.0	0.4	3	.....	.....	.....	.....	.....	3.2	.....	.....	
Western Gas Processors Ltd.—Baker, Fallon Co., sw4 sw4 6-7n-60e	2.5	1.8	3	.....	13.4	.....	3.5	.....	.....	3.3	.....	
Fairview, Richland Co., w2 sw4 24-25n-58e	6.0	3.5	3	.....	6.0	.....	7.4	.....	.....	.....	.....	
Total	28.0	10.3		.....	29.7	.....	8.6	7.4	7.9	8.1	1.4	
NEW MEXICO												
Amoco Production Co.—"Empire Abo, Eddy Co., 3-18s-27e	42.0	36.6	7	.....	29.3	.....	5.5	.....	77.2	6.3	.....	
Gallegos Canyon, San Juan Co., 33-27s-13w	5.0	0.2	3	.....	.....	.....	.....	.....	.....	0.2	.....	
Bannon Energy Corp.—South Blanco Creek, 6-7w-23n	6.0	3.7	3	2.8	5.1	1.0	2.7	.....	.....	3.0	.....	
Cabot Transmission Corp.—Hobbs, Lea Co., Sec. 28, 18s-36e	60.5	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	
Conoco Inc.—Maljamar, Lea Co., sw se 21-17s-32e	40.0	35.0	7	.....	.....	.....	.....	.....	180.0	.....	.....	
San Juan Co., 14-29n-11w	500.0	488.0	7	.....	.....	.....	.....	.....	1,508.5	.....	.....	
Davis, J.L.—Denton, Lea Co., 2-7-15s-37e	15.0	6.0	7	.....	.....	.....	.....	.....	42.0	.....	.....	
El Paso Natural Gas Co.—Chaco, San Juan Co., sw4 16-26n-12w	594.0	353.0	¹⁸ 2	.....	.....	.....	.....	.....	439.7	.....	.....	
Marathon Oil Co.—Indian Basin, Eddy Co., s23-121s-123e	180.0	104.4	7	.....	.....	.....	.....	.....	188.7	.....	¹¹ 13.1	
Meridian Oil Hydrocarbons Co.—Wingate, McKinley Co., 16s17-115n-17w .....	.....	.....	†	.....	(353.8)	(87.8)	(161.6)	.....	.....	(202.6)	.....	
Minerals Inc.—Hobbs, Lea Co., sw¼-sw¼-ne¼ 36-18s-36e	45.0	25.0	7	.....	.....	.....	.....	.....	40.0	.....	.....	
Northern Natural Gas Co.—Hobbs, Lea Co., 6-19s-37e	220.0	85.9	¹⁸ 2	.....	.....	.....	.....	.....	131.2	.....	.....	
Oxy U.S.A. Inc.—Bluff, Roosevelt Co., 15-8s-36e	27.5	20.7	7	.....	.....	.....	.....	.....	81.9	.....	.....	
Burton Flats, Eddy Co., Augustus Babbie, A-75	8.5	5.5	7	.....	.....	.....	.....	.....	11.0	.....	.....	
Phillips 66 Natural Gas Co.—Artesia, Eddy Co., s2 se4 7-18s-28e	63.0	49.3	7	.....	.....	.....	.....	.....	187.1	.....	.....	
Eunice, Lea Co., ne4 3-22s-37e	105.0	83.4	7	.....	.....	.....	.....	.....	437.2	.....	.....	
Lee, Lea Co., sw4 se4 30 nw4-ne4-31-17s-35e	54.0	43.5	7	.....	.....	.....	.....	.....	294.6	.....	.....	
Sid Richardson Carbon & Gasoline Co.—Jal No. 3, Lea Co., nw4-sw4 33-1-24s, r-37e	200.0	34.5	¹⁸ 2	.....	.....	.....	.....	.....	34.5	.....	.....	
Sunterra Gas Processing Co.—Kutz No. 1, San Juan Co., nw4 13-28n-11w	140.0	42.7	⁴⁰ 2	.....	9.9	.....	.....	.....	77.5	.....	.....	
Kutz No. 2, San Juan Co., nw4 13-28n-11w	80.0	61.9	7	.....	.....	.....	.....	.....	183.3	.....	.....	
Lybrook, Rio Arriba Co., nw¼ 14-23n-7w	80.0	71.6	7	.....	50.9	.....	.....	.....	178.0	3.1	.....	
Texaco Exploration & Production Inc.—Buckeye, Lea Co., se¼ of se¼ 36-17s-18s-34e, 1 mi se of Buckeye	25.0	5.2	6	.....	.....	.....	.....	.....	57.4	.....	¹¹ 0.4	
Eunice No. 1, Lea Co., 27-22s-37e	105.0	74.4	7	173.2	111.9	12.5	35.7	.....	.....	47.7	¹¹ 2.3	
Warren Petroleum Co.—Eunice, Lea Co., ne4 3-22s-37e	NR	48.0	7	.....	.....	.....	.....	.....	237.2	.....	.....	
Monument, Lea Co., sw4 36-19s-36e	NR	51.9	7	.....	31.8	.....	.....	.....	184.9	.....	.....	
Saunders, Lea Co., 34-14s-33e	NR	20.9	6	.....	.....	.....	.....	.....	160.0	.....	.....	
Vada, Lea Co., sw2-sw4-nw4 23-10s-33e	NR	10.0	6	.....	.....	.....	.....	.....	70.2	.....	.....	
Western Gas Processors Ltd.—San Juan River, San Juan Co., Sec. 1, t29n-r15w	60.0	21.1	⁷⁻²⁰ 1	.....	.....	.....	.....	.....	.....	.....	.....	
Total	2,655.5	1,782.4		176.0	238.2	13.5	43.9	.....	4,802.1	60.3	15.8	

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

NORTH DAKOTA

Cenex—Coyote Creek, Bowman Co., 131n-104w-27	3.0	0.6	¹⁹ 2	.....	1.0	.....	1.8	.....	.....	.....	.....	
Koch Hydrocarbon Co.—Grasslands, McKenzie Co., 36-148n-105w	70.0	51.3	7	.....	92.0	.....	62.6	.....	56.1	.....	.....	
Oxy U.S.A. Inc.—Lignite, Burke Co., nw4 7-162n-91w	11.0	5.4	1	.....	11.2	.....	5.4	.....	.....	6.1	¹¹ 3.8	
True Oil Co.—Red Wing Creek, McKenzie Co., ne27-148n-101w	9.0	2.7	¹⁹ 2	.....	3.1	.....	.....	9.8	.....	4.4	.....	
Warren Petroleum Co.—Little Knife, Dunn Co., 16-144n-99w	NR	15.6	7	.....	34.4	.....	.....	.....	34.0	.....	.....	
Western Gas Processors Ltd.—Alexander, McKenzie Co., e½ sw¼ sw¼ 18-152n-101w	3.0	1.8	3	.....	.....	.....	.....	.....	.....	.....	.....	
Teddy Roosevelt, Billings Co., nw4-ne4 16-142n-99w	25.0	3.0	2-7	.....	27.7	.....	21.0	.....	.....	14.6	.....	
Temple, Williams Co., Lot 4, 30-159n-95w	7.0	2.7	3	.....	.....	.....	.....	.....	8.8	.....	¹¹ 1.4	
Total	128.0	83.1			169.4		90.8	9.8	98.9	25.1	5.2	

OHIO

Columbia Gas Transmission Corp.—Various ...	20.0	8.5	3						6.4			
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OKLAHOMA

American Central Gas Cos. Inc.—Stroud, Lincoln Co., se4, 6-14n-8e	12.0	5.0	7						9.6			
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Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Thunderbird, Cleveland Co., 5-7n-1w.....	3.2	0.8	3						1.5		
Amoco Production Co.—											
Hitchcock-Okeene, Blaine Co., 13-17n-11w.....	55.0	25.2	7						53.0		
Mooreland, Woodward Co., 30-23n-16w.....	145.0	71.2	7						147.3		15.5
Anadarko Petroleum Corp.—											
Beaver Co., se 25-6n-21ecm.....	8.0	5.2	7						5.5		
North Richland Center, Texas Co.,											
33-6n-12ecm.....	25.0	15.0	4 ¹ 2		13.4				15.2		
ARCO Oil & Gas Co.—											
Covington, Garfield Co., w2-sw4 19-22n-3w.....	15.0	12.6	7	11.1	15.4	2.5	6.6			4.7	14.8
Associated Natural Gas Inc.—											
Custer, Custer Co., se14-14n-wim.....	10.0	6.1	6	9.8	8.0	1.5	2.6			2.3	
Kellyville, Creek Co., ne 27-17n-10e.....	15.0	1.0	6	<0.1	0.1	0.1	0.3			0.3	
Milley, Creek Co., nw/4 ne/4 21-15n-7e.....	15.0	8.7	3	<0.1	9.9	1.9	5.8			6.4	
Oakwood, Custer Co., se14-14n-14.....	10.0	4.4	7	8.6	6.5	1.1	1.9			2.0	
Aquila Energy—											
Elk City, Beckham Co., 15-10n-21w.....	85.0	46.9	7	19.5	20.6	3.9	8.0			9.3	
Beard Oil Co.—Choctaw, Oklahoma Co.,											
23-12n-1w.....	3.0	1.5	3						2.0		
Cabot Transmission Corp.—Beaver Co.,											
25-5n-23ecm.....	20.0	13.2	7						32.6		
Centennial Natural Gas Inc.—Tucumseh,											
Pottawatomie Co.....	25.0	10.5	3						40.0		
CNG Producing Co.—Southwest Davis,											
Murray Co., 15-15s-1e.....	2.0	0.7	4						2.8		
Coastal Oil & Gas Corp.—Custer Co.,											
ne4 5-13n-17w.....	200.0	121.0	7						170.2		
Colorado Interstate Gas Co.—Sturgis,											
Cimarron, 3-4n-8e.....	30.0	23.3						10.6			
Conoco Inc.—											
Cashion, Kingfisher Co., ne ne 9-15n-5w.....	30.0	16.0	6-7	25.4	21.7	2.8	8.2			9.2	10.6
Clinton, Custer Co., sw 23-12n-16w.....	75.0	70.0	6-7	57.8	36.8	6.8	9.5			11.7	10.1
Hennessey, Kingfisher Co., nw nw 36-19n-7w.....	30.0	23.0	6-7	22.5	15.1	2.1	5.7			6.8	10.2
Mustang, Grady Co., 30-10n-5w.....	40.0	36.0	6-7	24.3	21.8	3.3	8.4			12.4	11.0
Continental Natural Gas—Beaver Co.,											
se4-ne4 18-13n-r26e.....	40.0	0.1	3						132.5		
Damson Gas Processing Corp.—											
Hooker, Texas Co., 8-4n-17e.....	70.0	35.6	7						106.8		
Deisenroth Gas Products Inc.—Okemah,											
Okfuskee Co., 23-11n-9e.....	1.0	0.9	1						4.6		
Delhi Gas Pipeline Corp.—											
Antelope Hills, Roger Mills Co., 30-16n-24w.....	50.0	45.1	7						99.2		10.7
Beaver Co., 9-1n-27e.....	50.0	46.1	7						96.1		10.6
Cimarron, Blaine Co., nw4 24-18n-13w.....	90.0		7								
Custer Co., sw4 nw4 34-14n-16w.....	105.0	80.1	7						98.7		10.6
El Reno, Canadian Co., nw4 sw4 33-14n-7w.....	75.0	57.4	7						136.2		15.1
Stephens, Stephens Co., 14-1s-r5w.....	25.0		7								
Watonga, Kingfisher Co., w2 se4 35-15n-9w.....	40.0		7								
Woodward Co., sw4 nw4 29-23n-21w.....	75.0	22.3	7						59.1		11.6
Engorex Production Corp.—											
Calumet, Canadian Co., ne4 28-14n-9w.....	250.0	138.0	2		33.4	5.5	8.8			11.4	
Choctaw, Oklahoma Co., sec 18-11n-1e.....	6.0	2.8	7	1.6	2.9	0.4	1.5			1.4	
Dibble, McClain Co., 35-7n-4w.....	2.0	1.9	3	1.3	1.9	0.3	0.9			1.1	
Edmond, Okla. Co., 32-14n-4w.....	15.0	10.7	7	15.1	12.8	1.8	5.1			4.8	
Henrieville, Oklahoma Co., 33-13n-12e.....	10.0	5.3	6	1.5	2.8	0.6	1.2			1.4	
Slaughter, Cleveland Co., sec 11-7n-1e.....	0.8	0.4	3	0.4	0.7	0.1	0.4			0.3	
Wellston, Lincoln Co., 3-13n-2e.....	8.0	2.7	6	0.3	2.0	0.3	0.9			1.0	
Enserch Processing Partners Ltd.—											
Walville, Garvin Co., 27-4n-3w.....	6.0	4.7	2 ²						5.3		
Exxon Co. U.S.A.—Camargo, Dewey Co.,											
10-18n-17w.....	15.0	5.4	19 ²	6.0					5.7		
Dover-Hennessey, Kingfisher Co., 1-18n-7w.....	80.0	42.0	6	89.2	58.8	8.8	22.5			17.1	
Freeport McMoran Oil & Gas Co.—Tyrone,											
Texas Co., sw1/4 19-6n-19 ecn.....	36.0	18.4	7						45.3		12.0
Intersearch—Tucumseh, Pottawatomie Co.,											
sw1/4 36-9n-3e.....	5.0	7.5	3	7.3	13.0	1.9	6.4			5.6	12.6
Karr-McGee Corp.—											
Marlow, Stephens Co., 18-2n-7w.....	2.0	NR	2						1.6		
Koch Hydrocarbon Co.—Fitts, Pontoloc Co.,											
30-2n-7e.....	70.0	1.2	3		1.6				4.1		
Ladd Gas Gathering Inc.—Beaver Co.,											
30 4n-20ecm.....	20.0	18.9	7						41.1		12.9
Maxus Exploration Co.—Red Fork, Roger Mills											
Co., sw4-21w-15.....	30.0	27.0	7						72.4		
Mobil Oil Corp.—											
Chitwood, Grady Co., 34-5n-6w.....	90.0	75.0	7								
NE Trail, Dewey Co., 1-17n-18w.....	40.0	31.0	19 ²						325.0		
Postle Hough, Texas Co., 13-5n-13ecm.....	20.0	16.9	19 ²						46.9		
*Putnam-Oswego, Dewey Co., 35-18n-16w.....	50.0	35.0	7						29.1		
*Seiling, Woodward Co., 32-20n-17w.....	20.0	0.7	3						47.1		
Sholem Alechem, Stephens Co., 2-1s-4w.....	60.0	60.0	7								
Natural Gas Clearinghouse—											
Binger, Caddo Co., 26-10n-11w.....	15.0	5.7	7						29.2		
Madill, Marshall Co., 32-7e-5e.....	25.0	17.9	12							7.2	
Ringwood, Major Co., 11-22n-10w.....	80.0	48.3	12-7		22.7	2.2	7.3		148.5		
Octagon Resources Inc.—Enterprise, Payne											
Co., ne1/4 25-18n-5e.....	3.0	3.0	3						4.5		
HJD, Pawnee Co., nw1/4 7-20n-8e.....	6.0	2.0	3						7.0		
Meridian Energy, Lincoln Co., sw1/4 1-14n-5e.....	6.0	3.0	3						6.5		
Poll Gas, Lincoln Co., e1/2 23-14n-2e.....	10.0	5.0	3						7.5		
Oklahoma Gas Pipeline Co.—Tyrone, Texas											
Co., sw1/4 11-6n-18e.....	65.0	38.3	7	2.7	15.5	3.5	8.2		55.7	10.3	
Oryx Energy Co.—Burlington, Alfalfa Co.,											
32-28n-11w.....	3.0	0.5	3						0.3		
Carney, Lincoln Co., 12-15n-2e.....	18.0	10.5	7						44.7		

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Goldsby Central, McClain Co., 2-17n-3w....	65.0	44.5	7	.....	.....	.....	.....	.....	188.7	.....	.....
Laverne, Harper Co., 20-26n-25w.....	225.0	113.2	7	.....	96.9	13.9	33.1	.....	.....	43.4	⁵ 174.5 ¹¹ 2.5
Wakita, Grant Co., 5-27n-7w.....	15.0	11.6	¹⁷ 2	.....	.....	.....	.....	.....	30.7	.....	¹¹ 3.0
Oxy NGL Inc.—											
Ambrose, Kay Co., sw4 9-27n-1w.....	400.0	175.8	2	.....	.....	.....	.....	.....	282.3	.....	.....
Garrett, Kay Co., ne4-ne4 34-27n-1e.....	8.0	6.7	2	.....	.....	.....	.....	.....	.....	.....	.....
Murdock, Texas Co., 32-15n-16ecm.....	40.0	10.5	7	.....	.....	.....	.....	.....	36.3	.....	.....
Rodman, Garfield Co., 27-20n-5w.....	50.0	28.0	7	.....	.....	.....	.....	.....	102.9	.....	.....
Phillips 66 Natural Gas Co.—Aline,											
Cimarron, Woodward Co., e2 ne4 27-											
20n-17w.....	66.0	59.3	7	.....	.....	.....	.....	.....	153.0	.....	.....
Creek, Tulsa Co., s2 sw4 nw4 7-17n-13e.....	25.0	13.2	7	.....	.....	.....	.....	.....	38.3	.....	.....
Fox, Carter Co., 26-2s-3w.....	50.0	25.5	7	.....	.....	.....	.....	.....	149.2	.....	.....
Kingfisher Co., nw4 sw4 9-15n-5w.....	165.0	101.7	7	.....	.....	.....	.....	.....	373.6	.....	.....
Okarche, Kingfisher Co., se4 ne4											
31-15n-9w.....	165.0	94.4	7	.....	.....	.....	.....	.....	264.4	.....	.....
Tejas Gas Corp.—											
Antioch, Garvin Co., 17-3n-2w.....	10.0	5.9	3	.....	.....	.....	.....	16.0	.....	.....	.....
Pauls Valley, Garvin Co., 12-3n-1w.....	1.0	0.3	3	.....	.....	.....	.....	0.9	.....	.....	.....
West Guthrie, Logan Co., 30-15n-2w.....	15.0	11.0	7	.....	.....	.....	.....	40.0	.....	.....	.....
Texaco Exploration & Production Inc.—											
Enville, Love Co., 7-7s-3e.....	15.0	7.7	7	.....	.....	.....	.....	.....	27.4	.....	¹¹ 1.4
Maysville, Garvin Co., 18-4n-2w.....	114.0	133.2	7	285.4	189.2	18.4	66.8	.....	.....	69.4	.....
Camrick, Beaver Co., 31-1n-20 ecm.....	14.0	7.5	7	.....	.....	.....	.....	.....	18.2	.....	¹¹ 2.0
Velma, Stephens Co., 23-1s-5w.....	100.0	64.9	7	.....	.....	.....	.....	.....	251.0	.....	¹¹ 3.8
Tex/Con Oil & Gas Co.—Crescent, Logan Co.,											
nw 34-17n-4w.....	45.0	23.0	6	.....	.....	.....	.....	.....	121.0	.....	.....
*Elmore, Garvin Co., 17-1n-2w.....	40.0	18.0	7	.....	.....	.....	.....	.....	54.0	.....	.....
Red Ford, Roger Mills Co., 32-15n-21w.....	30.0	29.0	7	.....	.....	.....	.....	.....	75.5	.....	.....
Transok Inc.—Crystal Lake, Major Co.,											
12-20n-10w.....	6.0	6.0	3	.....	.....	.....	.....	.....	6.4	.....	.....
Greasy Creek, Hughes Co., 29-8n-11e.....	60.0	55.0	7	47.7	46.7	5.5	12.7	.....	.....	.....	.....
Line Creek, Grady Co., ne3-6n-8w.....	27.0	21.0	3	.....	.....	.....	.....	.....	18.1	.....	.....
Thomas, Custer Co., 33-14n-15w.....	130.0	95.0	7	.....	.....	.....	.....	.....	197.8	.....	.....
Union Pacific Resources—Enid, Garfield Co.,											
34-23n-6w.....	35.0	14.0	¹⁹ 2	.....	.....	.....	.....	51.8	.....	9.5	.....
Union Texas Petroleum Corp.—											
Chaney Dell, Major Co., 35-23n-10w.....	130.0	72.6	¹⁷ 2-7	102.9	69.6	11.0	26.3	.....	.....	43.4	.....
Chester, Woodward Co., 2-20n-17w.....	37.0	23.4	6-7	35.2	21.8	3.4	8.2	.....	.....	12.0	.....
Lamont, Grant Co., 19-26n-3w.....	30.0	13.9	¹⁷ 1-7	32.3	29.3	3.9	12.1	.....	.....	16.8	.....
Unocal—Caddo, Carter Co., 23-36-1e.....	10.0	3.4	3	.....	4.1	.....	.....	.....	3.3	.....	¹¹ 0.2
Valero Hydrocarbons Co.—											
Tecumseh, Pottawatomie Co., ne4 29-10n-											
3e.....	14.0	13.0	2	12.1	16.0	2.1	6.9	.....	.....	5.0	.....
Warren Petroleum Co.—											
Kingfisher Co., 11-15n-9w.....	NR	6.8	7	.....	.....	.....	.....	.....	17.4	.....	¹¹ 0.3
Knox, Grady Co., 33-3n-5w.....	NR	14.4	¹⁹ 2	.....	2.6	.....	.....	.....	14.1	.....	.....
Leedey, Roger Mills Co., 32-16n-21w.....	NR	28.3	7	.....	.....	.....	.....	.....	109.2	.....	.....
Moccane, Beaver Co., 18-5n-25e ecm.....	NR	51.4	¹⁹ 2	.....	.....	.....	.....	.....	117.3	.....	.....
Total.....	4,678.0	2,827.7		820.2	813.6	109.6	286.3	119.3	5,121.5	326.2	216.9

PENNSYLVANIA

Tembec Co.—Waynesburg, Greene Co.....	14.0	8.3	3	.....	4.7	.....	3.0	.....	.....	4.1	.....
Waynesburg, Greene Co.....	.....	.....	†	.....	(1.6)	.....	(1.5)	.....	.....	(1.3)	.....
Total.....	14.0	8.3		.....	4.7	.....	3.0	.....	.....	4.1	.....

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

TEXAS

Adobe Gas Gathering & Processing Co.—											
Apple Creek, Glasscock Co., 7-32-4s.....	30.0	19.1	7	.....	.....	.....	.....	.....	146.2	.....	.....
Adobe Resources Corp.—Sale Ranch,											
Martin Co., 23-37-1n.....	16.0	9.6	¹⁹ 2	.....	.....	.....	.....	.....	61.3	.....	.....
Amox Oil & Gas Co.—Kelton Gas Plant,											
Wheeler Co., 3 blk. A-2, AB&M survey.....	20.0	17.0	7	.....	.....	.....	.....	.....	44.2	.....	¹¹ 1.2
Ozona, Crockett Co.,											
se/4 2-2 I&GNRR survey.....	29.0	26.0	²⁶ 2	.....	.....	.....	.....	.....	88.3	.....	.....
Rocker B I, 17 miles ne of Big Lake.....	18.0	18.0	7	.....	.....	.....	.....	.....	100.0	.....	.....
Wharton, El Campo, se/4 31, A-245 H&GNRR											
survey.....	23.0	14.8	7	.....	.....	.....	.....	.....	48.9	.....	¹¹ 0.6
American Central Gas Cos. Inc.—Foster,											
Ector Co., sw 18-42, T & PRR.....	20.0	14.0	7	.....	.....	.....	.....	.....	130.0	.....	.....
Live Oak, sw/4 28 blk. c.....	10.0	13.5	7	.....	.....	.....	.....	.....	30.0	.....	.....
Santa Rosa Plant, Pecos Co.,											
2-105 H&GN RR.....	20.0	11.5	7	.....	.....	.....	.....	.....	60.0	.....	.....
Amoco Production Co.—											
Anton-Irish, Hale Co., 14-DT HE&WT RR....	12.0	2.0	3	.....	.....	.....	.....	.....	12.7	.....	.....
Cedar Lake, Gaines Co.,	3.0	1.3	⁴ 3	.....	.....	.....	.....	.....	9.4	.....	.....
Hastings, Brazoria Co., 1-ACH-DX-416.....	70.0	50.5	7	.....	.....	.....	.....	.....	12.4	.....	⁵ 3.6
Mallett Co., removal, Hockley Co., Labors											
16, 17 League 49 Scurry Co. School Land	140.0	55.7	1-5	.....	.....	.....	.....	.....	.....	37.8	.....
Midland Farms, Andrews Co., 842-T-1-N											
G&MMB&A.....	30.0	21.0	7	.....	.....	.....	.....	.....	141.8	.....	¹¹ 2.2
North Cowden, Ector Co., 34-5-43-IM T&P											
RR.....	25.0	14.2	7	.....	.....	.....	.....	.....	132.4	.....	.....
Old Ocean, Brazoria Co., Charles Breen											
League A-46.....	175.0	95.5	7	55.8	31.4	9.0	9.8	.....	.....	27.0	.....
Slaughter, Hockley Co., 14-15-59 Edwards &											
Scurry CSI.....	57.0	41.9	7	.....	114.7	.....	92.8	.....	.....	93.7	⁵ 182.8
Texas City, Galveston Co.,											
Refinery site in John Grant Survey A-72....	60.0	35.0	7	.....	.....	.....	.....	.....	14.3	.....	⁵ 20.1

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Watson ODC CO ₂ , Yoakum Co., 805-D JH Gibson Survey	80.0	48.1	2						84.4		
ARCO Oil and Gas Co. - "Block 31, Crane Co. 33-31 Univ. Lands A-522	265.0	275.2	3-7	131.3	80.1	10.1	38.7			46.9	
Carthage, Panola Co. A-522			3	0.8	1.2	0.9	1.4			4.6	
"Crane, Upton Co. 128-D CCS&RR Co.	15.0	9.9	3	44.0	22.0	2.6	7.4			5.4	112.8
El Dorado, Schleicher Co. 81-TT-TC RR	15.0	13.1	7	25.0	21.6	3.6	8.2			6.6	113.2
Longview, Gregg Co. J. Mosley	35.0	13.3	7	49.8	74.9	13.6	34.5			34.3	111.6
Silsbee, Hardin Co. George W. Brooks A-4	15.0	25.1	7	28.6	29.0	6.6	8.3			8.0	110.6
Spears, Gregg & Rusk Co., Mary Van Winkler	NR	1.1	7						0.6		
Arkla Inc. - Jefferson, Marion Co.											
Hairs of John Hanks A-188	3.0	0.6	3						0.4		
Waskom, Harrison Co. J. Blair	65.0	NR	3						20.0		
Willow Springs, Gregg Co., P. P. Rains	10.0	NR	3						6.5		
Associated Natural Gas Inc. - Wilcox											
Lavaca Co. JR Ragdale A-377	235.0	85.1	1/2	24.1	38.2	8.9	10.3			18.3	
Birtnight Gas Processing Ltd. - Birthright, Hopkins Co. Linecum A-561 and Hargrave A-426	10.0	3.5	3		3.4				7.0		111.8
Black Hawk Gasoline Corp. - Jack Co. R Stanton, A-1329	10.0	4.0	2	38.8	112.7	27.5	90.3	431.2		146.8	
Bristol Resources Corp. - Taft, San Patricio Co., Coleman Fulton Pasture Land	40.0	15.8	2/2		3.8		3.6			3.3	110.5
Brum Petroleum Inc. - Clarkson, Sutton Co.	20.0	20.0	7						35.0		
Hainesville, Wood Co.	6.0	5.0	3						9.0		
Trinidad, Henderson Co.	1.5	0.6	3						1.5		
Urbana, San Jacinto Co.	4.0	3.5	3						4.5		
Cabot Transmission Corp. - Arrington, Hemphill Co. 62-A-2 HAGNRR	40.0	29.7	2						37.6		
Carson Co. 4-5-I&GN	20.0	14.5	7						59.4		
East Goldsmith, Ector Co. 44-34, 1n, T&PRR	35.0	9.7	2-7						16.9		
Estes, Ward Co. 3-16 Univ. Land	11.5	6.7	7						39.7		
Gray Co. 152-3 I&GN	20.0	12.9	7						70.6		
Kingsmill, Gray Co. 152-3 I&GN	24.5	16.3	7						84.0		
Turkey Creek, Potter Co. 36-M20-G&M	40.0	27.1	2						84.3		
Walton, Winkler Co. 11-26 PSL	33.5	29.4	7						99.4		
Yake-Merchant, Moore Co.											
NW corner, J.W. Proctor survey	10.0		6								
Centennial Natural Gas Inc. - Outman, Woods Co.	5.0	2.1	3						15.0		
Clayton Gas Co. - La Grange, Fayette Co.											
James Green A-189	200.0	100.0	7						435.0		
Conoco Inc. - Bailey, Schleicher Co. 22-II	15.0	12.0	7						63.0		118.1
Chittim, Monroe Co. 35-6	5.0	1.1	3		3.3		4.7			2.3	
Eldorado, Schleicher Co. 33-m-GH&SA	85.0	33.5	3-7						40.8		114.8
Hemlin, Fisher Co. 9-R-26	15.0	9.3	7						89.9		115.2
McAllen, Hidalgo Co. Santa Anita, A-63	21.0	12.5	7						22.2		
Mertzon, Inon Co. Tom Green CSL 1	50.0	39.0	7						217.4		1176.9
Ramsley, Reeves Co. ne 1/4 36-58n-1w	11.0	7.0	3		10.8			15.0			
Davis Gas Processing Inc. - Big Lake, Reagan Co. 8 miles e of Big Lake	12.0	11.0	3						44.0		
Bowie, Montague Co. 3 miles ne of Bowie	8.0	3.0	3		6.0				6.0		
Concho, Concho Co. 4 miles s of Paint Rock	10.0	4.0	1/2		4.0				4.0		
Inon (Rockier B-2), Inon Co., 8 miles n of Barnhart	18.0	6.0	1/2						36.0		
Neleh, 5 miles sw of McCamey	10.0	5.0	3						18.0		
Robstown, Nueces Co. Fuente A-3											
Simmons & Perry subdivision	8.0	3.0	7						6.0		
Stiles, Reagan Co. 5 miles nw of Texon	6.0	4.0	1/2						24.0		
Texon, Reagan Co. 12 miles west of Big Lake	6.0	3.0	3						4.0		
Davis, J.L. - Claytonville, Fisher Co. 211-3											
H&TC RR, 12 mi n of Roscoe	6.0	2.5	6						13.0		
Peach Creek, Lavaca Co. A-32	15.0	4.0	7						16.0		
Pearsall, Frio Co. 1-A-307 Henry Castro	15.0	10.0	3						30.0		
Delhi Gas Pipeline Corp. - Booker, Lipscomb Co., w2 sw4 1116-43											
H&TC RR	6.0		3								
Coyanosa, Pecos Co. 18-143-T&SL RR	75.0	56.2	7						104.9		110.2
Denton Co. BBB&CRR A-161	30.0	6.9	1/2						24.4		
East Texas, Marion Co., John H. Kernels A-236	75.0		7								110.7
Grapeland, Houston Co., 2 JDJ Procetta League A-69	165.0	39.7	7						94.6		
Laredo, Webb Co., Porcion 14 of N.D.											
Hechar Estate	30.0	4.3	1/2						13.5		
Longview, Gregg Co., Frost Thom A-5	100.0	0.0	7								
Three Rivers, Live Oak Co., J.D. Jamison 168 A-268	25.0	2.6	7						15.8		
Diamond Shamrock R&M Inc. - McKee, Moore Co. 399-44 H&TC	375.0	171.4	1/2-7		145.7	32.2	72.8		124.8		286.7
Eagle Petroleum Corp. - Eagle-Thriftway, Young Co.	0.5	0.2	3						1.9		
Holiday No. 2, Archer Co.	1.5	0.4	3						1.1		
Endevco Natural Gas Co. - Bear Wallow											
Brazoria Co., Oliver Jones A-78	45.0	22.0	7						22.0		
Gun Point, Dewitt Co.	50.0	20.0	2/5								
Seven Sisters, Duval Co.	35.0	2.0	2/5								
Enerfin Partners I Ltd. - Quitman, Wood Co., S.G. Purse A-456	6.5	3.2	3						17.8		110.1
Enron Gas Processing Co. - DuBose, Gonzales	35.0	4.0	21								110.2

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Encinal, Webb Co.	35.0	20.0	7	....	15.0	....	9.0	....	....	7.0	....
Gregory, San Patricio Co., Geranimo Valdez A-269	70.0	60.5	192	....	23.0	....	17.0	....	....	10.0	....
Imperial, Crane Co., 20&21 1 H&TC RR-1..	18.0	14.4	7	....	....	....	....	....	45.0	0.5	....
McMullen Co.	15.0	12.6	192	....	17.0	....	13.0	....	....	9.0	....
Martin Co. No. 1, 31-37-2h TYP RR	10.0	8.3	3	....	....	....	....	....	47.5	....	....
Martin Co. No. 2 4-HA	5.0	3.3	3	....	....	....	....	....	16.0	....	....
Middle Concho, sw4 90-14 H&TC RR Co.	10.0	2.4	6	....	....	....	....	....	13.5	....	....
Robstown, Nueces Co., Mathis Garcia A-116	80.0	32.1	192	10.0	25.0	....	16.0	....	....	9.0	....
Sonora, Sutton Co., HE&WT RR A-352	55.0	60.6	172	....	22.0	....	26.0	....	....	15.4	....
Victoria Co., James Reed A-236	60.0	44.1	195	....	13.0	....	10.0	....	....	9.0	....
Enserch Processing Partners Ltd. -											
Chico, Jack Co., J.U. Fields A-218	30.0	17.0	7	....	....	....	....	....	67.4	....	....
Gordon, Palo Pinto Co., Thomas Reed A-384	50.0	32.4	7	....	....	....	....	....	121.8	....	....
Novice, Coleman Co., T&NO RR Co. 24-2..	4.5	3.1	3	....	....	....	....	....	5.3	....	....
Pueblo, Eastland Co., SPRR-464	20.0	14.0	7	....	....	....	....	....	78.9	....	....
Ranger, Eastland Co., H&TC RR 4-4..	18.0	14.7	3	....	....	....	....	....	103.3	....	....
Reprieve, Hardeman Co., L. Bechtol, 2	3.0	1.6	3	....	....	....	....	....	7.9	....	....
Santa Anna, Parker Co., Mary Ann Fisk 360, A-195	5.0	3.3	3	....	....	....	....	....	4.7	....	....
Springtown, Parker Co., J.L. Hodges A-690	80.0	56.5	7	....	....	....	....	....	190.6	....	....
Trinidad, Henderson Co., No. Addison A-17	65.0	63.8	7	....	....	....	....	....	79.5	....	....
Exxon Co. U.S.A. - Clear Lake, Harris Co.,											
James Lindsey A-43	133.0	71.0	192	....	....	....	....	....	63.0	....	....
Conroe, Montgomery Co., Ransom House	125.0	106.6	192	....	....	....	....	....	79.8	....	....
Cordona Lake GCF, Crane Co., nw 1/4	10.0	3.5	351-4	....	....	....	....	....	8.4	....	....
East Texas, Rusk, T. J. Martin	25.0	7.0	3-6	12.9	25.3	6.0	14.8	....	....	20.8	....
Hawkins, Wood Co., H. Watson	110.0	95.2	192	16.2	36.3	13.7	16.8	....	....	31.5	....
Hawkins Cryogenic, Wood Co., H. Watson	30.0	18.7	7	....	....	....	....	....	15.7	....	....
Katy, Waller Co., T. S. Reese 110, A-332	960.0	334.0	192	263.0	120.0	....	121.0	....	....	....	....
King Ranch, Kleberg Co., R. King A-172	1,000.0	585.0	192	430.8	234.8	67.2	65.7	....	....	133.1	....
Means GCF, Andrews Co., PSL A-35											
nw corner of 12	40.0	30.0	351-4	....	....	....	....	....	....	....	....
Neches, Cherokee Co., J. H. Shaw	30.0	20.0	192	3.9	5.8	0.8	3.2	....	....	5.8	....
Pyote, Ward Co., 32-16 ULS	70.0	41.0	235-7	....	....	....	....	....	56.7	....	....
Sabine Lake, Orange Co., Wm. A. Davis A-7	25.0	10.7	7	....	....	....	....	....	30.1	....	....
Tom O'Connor, Refugio Co., Maria Ximines A-324	165.0	134.0	7	29.8	15.4	7.7	7.9	....	....	31.8	....
Fort Chadbourne Corp. - Box Elmdale, Callahan Co., 4 miles e of Abilene											
	4.0	2.0	3	....	....	....	....	....	4.0	....	....
Tuscola, Taylor Co., 2 miles w of Tuscola	4.0	2.0	3	....	....	....	....	....	5.0	....	....
Four Star Oil & Gas Co. - Headlee Devonian, Ector-Midland Co., ne 1/4 of nw 1/4 29-41-2s T&PRR											
	190.0	169.4	7	....	....	....	....	....	117.1	....	117.9
Hunt Oil Co. - Amacker-Tippett, Upton Co., 77&78 blk Y, GC&SF RR survey	12.0	6.5	3	....	....	....	....	....	15.2	....	....
*Fairway, Henderson Co., Jose Mora A-497	87.5	54.6	1-402	....	....	....	....	....	104.3	....	....
*Pecos Valley, Pecos Co., 106-T&ST-L	10.0	2.7	3	....	....	....	....	....	3.5	....	....
Kerr-McGee Corp. - Chapel Hill #35, Smith Co., Stillwell Box A-169	35.0	NR	7	....	12.1	....	10.2	....	13.0	....	....
Hobart Ranch, Hemphill Co., 70 A-2 N&GN	43.5	NR	7	....	....	....	....	....	58.8	....	....
Mapco Westpan Inc. - Bivins, Moore Co.,											
33-PMC, ELRR	100.0	43.0	462	....	....	....	....	....	119.9	....	....
Fritch 950, Hutchinson Co., 92-Y2-TTRR	60.0	32.9	432	....	....	....	....	....	126.4	....	....
Fritch 1000, Hutchinson Co., 92-Y2-TTRR	100.0	0.0	432	....	....	....	....	....	....	....	....
Marathon Oil Co. - Markham, Matagorda Co.,											
4-9-9	21.0	16.0	3	....	....	....	....	3.0	....	....	....
Susan Peak, Tom Green Co., 193 SPRR-11	3.3	2.7	3	....	....	....	....	....	5.4	0.4	....
Welder, San Patricio Co., 49 Robert Montgomery 199 and Ewan Cameron A-97	2.0	0.5	6	....	....	....	....	0.4	....	....	....
*Yates, Pecos Co., I.G. Yates, 194 SF 1234-1	172.0	83.5	3-7	....	....	....	....	....	61.7	....	111.0
Meridian Oil Hydrocarbons Co., Benedum Plant, Upton Co., w2 46 Y MK&T RR											
	90.0	93.8	7	....	....	....	....	....	409.4	....	....
Mesa Limited Partnership - Fain, Potter Co., G&M 10-181-8											
	80.0	60.9	12-7	....	....	....	....	....	226.5	....	....
Mil's Bennett Estate - Brooks Co.,											
Polo Blanco de Charco Redondo A-258	5.0	1.1	3	....	....	....	....	....	1.0	....	....
Mitchell Energy & Development Corp. -											
Alabama Ferry, Madison Co.	5.0	5.6	3	....	....	....	....	....	9.6	....	....
Barton Chapel 1, Jack Co.	15.0	7.3	7	....	....	....	....	....	31.3	....	....
Barton Chapel 2, Jack Co.	20.0	9.8	7	....	....	....	....	....	41.8	....	....
Bee County #1, Bee Co.	20.0	9.9	7	....	....	....	....	....	14.2	....	....
Bee County #2, Bee Co.	20.0	9.9	7	....	....	....	....	....	14.2	....	....
Bee County #3, Bee Co.	20.0	9.9	7	....	....	....	....	....	14.2	....	....
Bridgeport 1, Wise Co.	150.0	106.6	7	....	87.4	12.8	15.4	....	392.1	....	....
Bridgeport 2, Wise Co.	20.0	14.2	7	....	11.7	1.7	2.1	....	52.3	....	....
Bridgeport 3, Wise Co.	20.0	14.2	7	....	11.7	1.7	2.1	....	52.3	....	....
Bryan Hicks, Brazos Co.	20.0	5.3	7	....	....	....	....	....	25.8	....	....
Cisco, Eastland Co.	15.0	8.8	7	....	....	....	....	....	46.1	....	....
Gum Island, Jefferson Co.	20.0	11.7	7	....	....	....	....	....	40.2	....	....
Huckabay No. 1, Erath Co.	15.0	7.8	7	....	....	....	....	....	30.2	....	....
Huckabay No. 2, Erath Co.	15.0	7.8	7	....	....	....	....	....	30.2	....	....
Huckabay No. 3, Erath Co.	15.0	7.8	7	....	....	....	....	....	30.2	....	....
Live Oak, Live Oak Co.	20.0	9.2	7	....	....	....	....	....	14.0	....	....
Lone Camp No. 2, Palo Pinto Co.	10.0	5.2	7	....	....	....	....	....	24.6	....	....
Lone Camp No. 3, Palo Pinto Co.	10.0	5.2	7	....	....	....	....	....	24.6	....	....
Lone Camp No. 4, Palo Pinto	30.0	15.7	7	....	....	....	....	....	73.8	....	....
Madison #1, Madison Co.	20.0	17.8	7	....	....	....	....	....	52.0	....	....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Madison #2, Madison Co.....	20.0	17.8	7						52.0		
Madison #3, Madison Co.....	20.0	15.6	7						43.4		
Mineral Wells, Palo Pinto Co.....	15.0	9.3	7						51.0		
Ponder, Denton Co.....	2.0	1.4	6						4.1		
Port Arthur, Jefferson Co.....	115.0	66.4	7						73.8		
Port Arthur II, Jefferson Co.....	35.0	20.3	7						22.4		
Rockdale, Milam Co.....	20.0	2.0	7						8.1		
Seven Oaks, Polk Co.....	20.0	7.7	2						15.0		
Springtown, Parker Co.....	15.0	5.6	7						14.5		
Wellborn, Brazos Co.....	5.0	0.5	3						4.7		
Winnie, Jefferson Co.....	75.0	59.3	7						57.1		
Mobil Exploration-Producing U.S. Inc.—											
East White Point, San Patricio Co., G.H. Paul subdiv. of Coleman Fulton Pasture											
Land.....	25.0	14.0	7						25.0		
LaGloria, Jim Wells Co., 9-3 Rangeland 7											
Herring subdiv. LaGloria Townsite subdiv..	265.0	200.0	7	180.0	90.0	31.0	24.0			67.0	
*Lake Creek, Montgomery Co.....	5.5	4.5	7						4.2		
*Portillo, San Patricio Co., M. S. Welder.....	17.0	18.0	2						13.3		
Mobil Oil Corp.—Coyanosa, Pecos Co.,											
46-OW TTRR.....	125.0	125.0	7						172.2		
East Canadian, Hemphill Co., David Crockett.....	50.0	8.0	7						20.0		
Electra, Wilbarger Co., 17-13 H&TC RR.....	1.2	0.8	12						12.8		
Feldman, Hemphill Co., H&TC RR 42-44.....	3.0	3.0	6						6.3		
*Pegasus, Midland Co., 62 30-40-4s T&PRR.....	110.0	92.0	7	96.6					187.0		
Salt Creek, Kent Co., W&NW RR G-193.....	28.0	21.0	3						226.4		
Sandhills, Crane Co., Sec. 4, Blk 32, Public School Land.....	25.0	6.8	7-13								
University Waddell, Crane Co., Sec. 1, Blk. 31, University Lands.....	1.5	1.1	13-21								
Waha, Pecos Co., 5-C3 PSL.....	125.0	60.0	7						128.0		
Will-O-Mills, Val Verde Co., Sec. 9, Blk Q4, TCRR.....	25.0	12.0	13-20								
Natural Gas Pipeline Co. of America—											
CP 170, Moore Co., w/1/4 section 1 of TTRR.....	80.0	60.3	7						178.8		
Northridge Corp.—Desdemona, Eastland Co. Oryx Energy Co.—Big Wells, Dimmit Co., I&GN A-223 82-1.....	NR	0.8	3						4.3		
Canales, Jim Wells Co., 343 CCSD&R GNG RR A-119.....	20.0	8.2	12		18.4		18.8			6.4	
Diamond M, Scurry Co., SE 182-97 H&TC RR.....	40.0	20.0	12		6.5		6.2			4.3	19.7
Jameson, Coke Co., 315-1A N&TCRR.....	18.0	9.0	6						111.1		114.2
Snyder, Scurry Co., 16-1 JP Smith.....	70.0	37.7	6-7		92.1		44.4			29.8	111.8
Sun, Starr Co., 239 AB-226 CCSDR GNG RR.....	60.0	93.1	7		67.1	13.7	42.4		268.8	67.4	110.1
Oxy NGL Inc.—Chico, Wise Co., 3 GH&HRR A-384.....	120.0	123.7	7		57.3		53.6			42.0	166.3
East Texas, Gregg Co., William Castleberry A-38.....	100.0	62.1	7						386.4		
Eustace, Henderson Co. Vincente Michelli A-485.....	27.0	23.8	7						210.1		
Flatrock Creek, Young Co., 6 acres, M. Case A-1402, (File 8 NGL 2630).....	70.0	13.0	7						43.6		
Gulf Coast fractionation—Chambers Co., Henry Griffin League A-12.....	10.0	7.8	2						26.3		
Graham, Young Co., 4 acres e 53 1/2 acres subdiv 15 TE&L A-3412 (File 10-NGL 2631).....			1	(907.0)	(794.7)	(168.3)	(384.2)			(347.7)	
Lefors, Gray Co., 2-1-ACH&B.....	7.0	3.9	3						6.7		
Mont Belvieu fractionation, Chambers Co., Henry Griffin, League A-12.....	11.6	6.9	7						74.4		
Myrtle Springs, Van Zandt Co., J. Salingua A-765.....			1	(1,161.3)	(969.3)	(192.8)	(444.6)			(388.9)	
Roberts Ranch, Midland Co., 16-41-3s T&PRR.....	25.0	22.4	2		18.0		18.2			5.1	
Welch, Dawson Co., 67 M, EL&RR.....	85.0	69.3	7						151.9		
West Seminole, Gaines Co., 335 GCSD & RGNG RR.....	3.0	1.6	2						18.3		
Parker & Parsley Gas Processing Co.—Cargray, Carson Co., 46-4 I&GN.....	30.0	12.5	7						52.3		
Ibex, Shackelford Co., nw 1/4 28 BAL.....	30.0	24.0	7	25.6	47.2	9.1	24.3			31.7	
Schafer, Carson Co., 88-4-1n I&GN RR.....	10.0	4.2	19		8.0	0.8	2.5		4.0		
South Bend, Young Co., J. Garrett.....	25.0	13.2	4				3.5				
Sterling Co., 10-22 H&TC.....	10.0	4.8	19		10.0	1.0	3.3		5.0		
Woodlawn, Harrison Co., A-750.....	40.0	22.0	6						40.0		
Permian Operating Ltd. Partnership—Possum Kingdom, Stephens Co., E. Romerhausen A-149.....	100.0	20.0	19						27.0		
Todd, Crockett, 28-WX GC&SF RR.....	5.0	2.0	3						5.3		
Phillips, Jack L.—Nan Su Gail, Freestone Co. Phillips 66 Natural Gas Co.—	5.0	3.5	3						14.0		
Crane Co., ne 1/4 216-F CCSD&RGNG RR.....	7.0	1.0	3						2.0		
Dumas, Moore Co., nw 1/4 181-44 H&TC.....	25.0	19.2	7						148.6		
Fullerton, Andrews Co., Center S-17 A-32 PSL.....	120.0	81.7	7						321.9		
Giddings, Fayette Co., David G. Green A-193 Goldsmith, Ector Co., nw 1/4 34-33-44.....	62.0	58.3	7						580.4		
T&P-1n.....	75.0	63.1	3						385.5		
Gray Co., e 1/2 32-2 H&GN.....	195.0	87.6	7						567.7		
	70.0	26.9	2						148.9		

Company, plant, location	MMcfd			Production 1,000 gpd					(Average based on the past 12 months)		
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Luling, Caldwell Co., north corner John Henry A-12	12.0	7.7	7						30.9		
Pantex, Hutchinson Co., 8&9 M. Whitley	20.0	3.5	7						92.4		
Puckett, Pecos Co., n2 26-101 TCRR	94.0	64.4	65						2.3		
Rock Creek, Hutchinson Co., nw4-22-y A&B	180.0	126.3	7						516.9		
Sherman, Hansford Co., 7&8-1 PSL	250.0	206.8	7						627.6		
Spraberry, Midland Co., se4-25 3s-37 T&P	80.0	59.1	7						465.5		
Portal Drilling Co.—McMullen Co., Benjamin Odium A-9	2.2		3								
Pronto Gas Products Inc.—Moran, Shackelford Co.	1.0	0.5	3						2.0		
Wall, Tom Green Co.	0.8	0.2	3-6						0.6		
Seaguli Energy Corp.—Matagorda Co., Lot 29 Moore Pasture subdivision	250.0	230.0	7	59.7	50.2	28.0	14.8			35.7	
Northwest Mendota, Roberts Co., nw/4 sec 3-bk 2-1	12.0	7.9	3						18.2		
Allen Hill, Tom Green Co., 10, bk 22	1.5	0.6	6	0.1	0.3	<0.1	0.2			0.3	
Shannon Energy Corp.—Mobeetie, Wheeler Co. (Gasoline plant) 46-BLK A-5 H&GN	3.0	1.0	3						2.0		
Shell Western E&P Inc.—Armadillo, Pecos Co., GC&SF R-3-5	2.0	1.0	2						3.3		
Big Foot, Frio Co.	0.5	0.2	3								
Bryans Mill, Cass Co., B.F. Lynn A-651	70.0	48.0	2		18.2			31.7			
Denver Unit CO ₂ , Yoakum Co., nw/4 827 sw/4 802-D John H. Gibson	140.0	175.6	2	34.9	70.7	11.9	28.1			49.4	
Fandango, Zapata Co.	90.0	0.0	291								
Houston Central, Colorado Co., F. Mayhar A-400 K. Winn A-589	700.0	419.2	2-7	233.4	176.9	44.1	52.1			108.2	
Terrell, Terrell Co., sw/4 se/4 22-Y	250.0	162.0	1								
Tippett, Crockett Co., 38-31-H&TC RR	55.0	19.9	6	29.6	23.8			31.4			
TXL, Ector Co., 17-45-1s T&P RR	40.0	19.5	2	33.4	38.9			14.4		16.7	
Wasson, Yoakum Co., nw/4 827 sw/4 802-D, John H. Gibson	95.0	38.8	2	28.1	69.7			45.9			
Sid Richardson Carbon & Gasoline Co.—Chalk, Cottle Co., nw/4 of C.L. Carter FP 4480	15.0	5.9	3						10.3		11.0
Eskota, Fisher Co., 11 T&PRR-19	12.0	5.0	6						45.7		120.2
Halley, Winkler Co., e2-22-B11-PSL	60.0	18.1	7						63.8		110.6
Keystone, Winkler Co., 5-B2 & 1&2 B3-PSL	120.0	139.5	7						416.5		112.0
											120.5
SPG Exploration Corp.—Martha F. Berry, Frio Co., M.C. Patton, 1178 A-542	5.0	3.0	6						7.0		
Ozona, Crockett Co., nw/4 BMN GC&SF RR	60.0	25.0	192		33.0		15.5			8.0	
Taurus Energy Corp.—Shackelford, Callahan Co., nw corner 24 sw corner 23 Bayland Orphan Home Land	30.0	13.0	192						43.5		
Tejas Gas Corp., Copano, Aransas	20.0	20.0	7					39.0			
Tenneco Natural Gas Liquids Corp.—Magnolia City, Nueces Co.	60.0	50.9	7						64.3		
Texasco Exploration & Production Inc.—Bradford Ranch, Midland Co., 13-39-3s, T&P RR	16.0	15.7	7						71.1		11.8
East Vealmoor, Howard Co., 20-27-H&TC	50.0	32.7	192	115.4	122.7	14.7	49.4			51.6	11.7
Fuller, Scurry Co., ne/4 652-97 H&TC RR	5.0	3.1	3						37.9		
George West, Live Oak Co., G.W. West sub D 200&201	23.0	13.9	6-7						34.6		110.2
Handy, Grayson Co., se/4 I&GN RRA-1441	12.0	0.8	192						6.0		
McLean, Gray Co., 68-23 H&GN RR	26.0	20.0	7						47.7		110.3
Ozona, Crockett, n/4 3-MN, GC&SF RR	25.0	17.3	7						66.9		
South Kermit, Winkler Co., sw/4 22 B-3, PSL	42.0	13.6	7						38.6		110.9
Spearman, Ochiltree Co., 23-R-B&B	50.0	26.9	2		17.9				18.4		11<0.1
Streetman, Freestone Co., A-536, Jefferson Richards	7.5	2.4	6-7						12.4		
Union Pacific Resources—A&M, Burleson Co., John P. Coles A-12	50.0	34.0	3-7						184.1		
Bryan, Brazos	35.0	33.0	3-6						246.5		
Conger, Glasscock Co.	6.0	3.0	3						7.1		
Conroe, Montgomery Co.	65.0	39.0	7						42.9		
East Texas, Panola Co.	520.0	452.0	7						467.0	181.5	5372.5
Gulf Plains, Nueces	135.0	101.0	7	110.2	50.9		33.9			71.2	
Union Ridge Oil & Gas Corp.—Kosciusko, Wilson Co., 1 mile n of Kosciusko, Tex.	8.0	2.0	3						2.0		
Jupiter, Jack Co., 3 miles south of Cundiff, Tx.	5.0	4.1	3						8.0		
Longhorn, Archer Co., 5 miles south of Wichita Falls, Tx.	3.0	1.3	3						4.0		
Union Texas Petroleum Corp.—Benedum, Upton Co., Sect. G, C. Bendle A-657	30.0	27.5	7	83.9	62.1	7.0	21.4			26.8	
East Sour Lake, Hardin Co., 384 A-784											
J.F. Keith	20.0	5.3	7	2.4	5.0	1.5	1.6			2.1	
Noel, Eastland Co., ne 4 31-3 H&TC RR	30.0	12.1	7	37.3	29.8	4.1	10.4			11.2	
Perkins, Coke Co., 2-H&TC RR	25.0	15.8	7	41.6	38.2	5.3	11.9			21.5	
Walnut Bend, Grayson Co., E.L. Stickney A-1089	10.0	4.1	7	11.5	9.6	1.4	3.8			4.4	
United Texas Transmission Co.—Galveston Bay, Chambers Co., J. Armstrong A-2	40.0	10.5	7						4.1		11<0.1
Unocal—Dollartide, Andrews Co., 25-A52-PSL	13.0	5.2	6						47.6		
Fort Trinidad, Houston, Co., RCS A-23	40.0	10.8	382		8.3		6.4			5.8	
North Riley, Gaines Co., 365-g-CSDRGNG	2.5	1.5	3						8.6		
Van, Van Zandt Co., JWS A-891	15.0	10.8	382		6.9		10.0			12.1	
Upham Oil & Gas Co.—Bridgeport, Wise Co., Wm. Hersee	12.0	6.0	2		7.8		4.4		5.5		
USAgas Pipeline Co.—McLeod I, Cass Co. Williams R Myers A-766	12.0	8.0	7						18.0		110.4
McLeod II, Cass Co. Williams R Myers A-766	8.0	8.0	7						8.0		

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Valero Hydrocarbons Co.—Armstrong, DeWitt Co. James A. Moody A-333.....	400.0	324.3	2-7	229.7	128.9	26.4	36.8	.....	.....	48.2	.....
Freer, Webb Co. BS 1-4 A-1954.....	220.0	183.6	2	26.4	51.1	18.8	20.7	.....	.....	35.4	.....
Garden City, Sterling Co., 30-22, A-698.....								.....	.....		.....
H&TC RR.....	55.0	41.0	3-7	80.4	77.7	8.9	24.4	.....	.....	17.4	.....
Gilmore, Hidalgo Co., TexMex RR A-211....	90.0	66.4	7	67.2	30.4	10.4	8.8	.....	.....	19.5	.....
Ozona, Crockett Co., 10 45- DP GC&SF RR	20.0	15.8	5-7	13.4	10.9	1.7	3.4	.....	.....	3.5	.....
San Martin, Bexar Co. 4010 F. Farias.....								.....	.....		.....
15 A-2.....	190.0	129.3	7	100.8	67.2	14.5	22.1	.....	.....	29.6	.....
Shoup, Nueces Co., AB&M 409 A-555.....	250.0	246.9	3-7	177.0	90.9	29.5	25.9	.....	.....	48.3	.....
Sonora, Sutton Co., 122, HE&WTRR A-1117	44.0	23.0	7	24.1	19.4	3.1	6.4	.....	.....	6.6	.....
Sterling plant and field, 11 2-31-5.....								.....	.....		.....
South T&PRY.....	40.0	33.4	3-5-7	62.9	56.0	6.5	17.3	.....	.....	12.6	.....
Warren Petroleum Co.—											
Breckenridge, Stephens Co., n2 22 LAL.....	NR	10.0	7	.....	.....	.....	.....	.....	55.0	.....	.....
Canadian, Hemphill Co., 216 G&MMB&A-C	NR	11.0	7	.....	.....	.....	.....	.....	27.6	.....	110.2
Como, Hopkins Co., Nacogdoches Univ. #19											
A-703.....	NR	14.7	7	.....	12.3	.....	12.6	.....	.....	6.0	120.6
Fashing, Atascosa and Kames Cos., Emma Tar H. et al, tract in James Wilkerson											
144 A-882.....	NR	44.8	192	.....	13.4	.....	9.0	.....	.....	19.2	.....
Monahans, Ward Co., 4-F.....	NR	17.1	7	.....	.....	.....	.....	.....	84.1	.....	.....
Moore's Orchard, Fort Bend Co., German Emigration No. 8 A-117.....	NR	7.4	7	.....	.....	.....	.....	.....	.....	16.2	.....
Sand Hills, Crane Co., 21-PSL B-21.....	NR	95.8	192-7	.....	.....	.....	.....	.....	419.9	.....	.....
Shackelford Co., TE&L 522 & 523.....	NR	7.5	7	.....	.....	.....	.....	.....	50.2	.....	.....
Sherman North, Grayson Co., Uriah Burns A-121.....	NR	5.3	192	.....	5.9	.....	.....	.....	5.3	.....	111.1
Sherman South, Grayson Co., James S. Coffee A-232.....	NR	1.0	4	.....	.....	.....	.....	.....	.....	.....	11<0.1
Tonkawa, Hemphill Co., 78-41 H&TC RR.....	NR	2.2	3	.....	.....	.....	.....	.....	2.5	.....	110.2
Worsham, Ward Co., 56-34 H&TC RR.....	NR	6.8	7	.....	.....	.....	.....	.....	19.0	.....	.....
West Texas Gas Inc.—Markley, Jack Co.....	12.0	2.0	4	.....	.....	.....	.....	.....	0.5	.....	.....
Western Gas Processors—Edgewood, Van Zandt Co., 2 Roberts A-702.....	60.0	28.0	19-40/2	.....	.....	.....	.....	10.0	22.0	.....	1140.1
Midkiff, Upton Co., nw4 n2 sw4-22 1-5-s blk. 37.....	80.0	62.3	191	.....	.....	.....	.....	.....	339.2	.....	.....
WW Sub Inc.—Markley, Jack Co., SPRR A-583.....	2.0	1.0	3	.....	.....	.....	.....	.....	2.8	.....	.....
Total.....	16,470.1	10,492.7		3,069.6	3,197.9	520.1	1,434.9	601.6	15,965.3	1,542.8	1,389.5

† Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). §Butane-gasoline mix.

UTAH

Chevron U.S.A. Inc.—Red Wash, Uintah Co., nw4 21 nw4 22-7s-23e	7.0	5.3	72	....	....	....	....	....	1.0	....	....
Coastal Oil & Gas Corp.—Altamont, Duchesne Co., 34-1s-4w	40.0	24.0	3	....	15.2	....	16.5	....	....	16.4	119.9
Gary-Williams Energy Corp.—Bluebell, Duchesne Co., sw-nw 23-1s-2w	23.0	14.0	192	....	13.4	....	....	....	24.8	....	....
Koch Hydrocarbon Co.—Cedar Rim, Duchesne Co., 21-35-6w	12.0	3.8	3	....	2.5	....	2.4	....	....	3.8	....
Marathon Oil Co.—Tin Cup Mesa, San Juan Co., 2s-38s-25e	1.5	0.5	3	....	....	....	....	....	2.6	....	....
Phillips 66 Natural Gas Co.—Bridger Lake, Summit Co., 25-3n-14e	34.0	26.7	7	....	....	....	....	....	36.0	....	....
Questar Pipeline Co.—Price, Carbon Co., 8-14s-10e	120.0	105.3	3	....	....	....	....	....	4.8	....	....
Texaco Exploration & Production Inc.—Aneth, San Juan Co., nw4-6-14s-r24e	100.0	10.0	171	....	24.9	....	....	....	27.1	....	....
Union Pacific Resources—Pineview, Summit Co., 3-2n-7e	10.0	2.0	3	....	3.5	....	....	....	10.1	....	....
Yellow Creek, Summit Co., 16-3n-8e	80.0	35.0	7	....	13.4	....	....	....	13.1	....	....
Unocal—Lisbon, San Juan Co., 22-30s-24e	80.0	59.1	3	....	19.1	....	11.8	....	....	16.9	....
Western Gas Processors Ltd.—Four Corners, San Juan Co., se1/4 sec19 24e 38s	15.0	6.6	3	....	....	....	....	....	17.1	....	11.0.1
Total	522.5	292.3		92.0	30.7	136.6	37.1	10.0			

WEST VIRGINIA

Columbia Gas Transmission Corp.—Cobb, Kanawha Co., Big Sandy district	35.0	29.0	192	....	....	....	....	....	55.4	....	....
Kenova, Wayne Co., Ceredo district	140.0	105.0	192	....	....	....	....	....	173.0	....	....
CNG Transmission Corp.—Hastings, Wetzel Co.	150.0	111.3	3	204.4	125.6	20.3	38.7	....	39.8	....	....
Pennzoil Products Co.—8 small plants	7.5	3.0	4	....	....	....	....	....	0.4	....	....
Tejas Gas Corp.—Copley Run, Lewis Co.	40.0	31.0	7	....	....	....	....	....	38.2	....	....
Schultz, Pleasants Co.	10.0	8.1	7	....	....	....	....	....	24.0	....	....
West Union, Doddridge Co.	15.0	13.0	7	....	....	....	....	....	26.0	....	....
Total	397.5	300.9		204.4	125.6	20.3	38.7	88.2	268.6		

WYOMING

Amoco Production Co.—Anschutz Ranch East, Uinta Co., 26-24-35 13n-121w 6PM	700.0	680.0	7	....	....	....	....	....	1,176.0	....	11865.0
Baird CO ₂ Removal, Sweetwater Co., 7-26n-90w	150.0	86.3	1-3-4	....	....	....	....	....	36.4	....	....
Beaver Creek, Fremont Co., 10-33n-96w	65.0	24.0	19-42/2	....	9.5	....	9.2	....	....	10.2	....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Beaver Creek Phosphoria, Fremont Co., 10-33n-96w	14.0	6.0	4								
Elk Basin, Park Co., 29-48n-99w	17.0	9.1	19-44/2		12.3		13.1			15.6	115.0
Painter NRU-NGL, Uinta Co., sw 1/4 32 16n-119w	240.0	224.0	7						585.4		1146.5
Salt Creek Gas Plant, Natrona Co., w/half of s35 1-40n, r-79w	2.0	1.4	1-3		2.6				5.8		
Whitney Canyon, Uinta Co., 17-17n-119w	275.0	131.8	7						135.2		1167.6
ARCO Oil & Gas Co.—Riverston Dome, Fremont Co., 36-1s-4e	30.0	6.8	28/2							1.7	
Chevron U.S.A. Inc.—Carter Creek, Uinta Co., 6-18n-119w	150.0	129.0	7/2						65.7		1109.2
Colorado Interstate Gas Co.—Rawlins, Carbon Co., sw4-sw4 25-21n-86w	200.0	216.0	19/2		32.4		42.6			22.0	
Enerfin Partners I Ltd.—Gillette, Campbell Co., 1-49n-74w	6.0	1.4	3		3.3				4.2		
Enron Gas Processing Co.—Painter, Uinta Co., nw4 6-15n-119w	35.0	38.7	3						44.4		
Exxon Co. U.S.A.—Shute Creek, Lincoln Co., 22n-112w-14	550.0	520.0	35/1 29/2 23/5 6-7								
Garret Petroleum Co. Rock River, Carbon Co., 34-19n-78w	0.5	0.2	3						0.4		
Interline Natural Gas Inc.—Well Draw, Converse Co., 9-35n-70w	25.0	3.0	3		3.7			2.4		2.5	
John Brown E&C Inc.—NPR 3 Teapot Dome, Natrona Co., swne 4 38n-78w	10.0	9.0	3		2.0					6.3	
KN Energy Inc.—Casper, Natrona Co., 10-33n-78w	80.0	75.0	1		22.0		17.0			9.0	
Marathon Oil Co.—Oregon Basin, Park Co., 29-51n-100w	6.5	5.8	3						14.1		
Northwest Pipeline Corp.—Opal, Lincoln Co., 27-21n-114w	425.0	260.0	19/2-7		86.0		35.3		55.9	39.1	
Oryx Energy Co.—Lucky Ditch, Uinta Co., 18-12n-11w	15.0	7.0	3						16.6		
Phillips Petroleum Co.—Douglas, Converse Co., se4-ne4 34-33n-71w	95.0	34.5	7						200.6		
Presidio Gas Resources—Green River, Sweetwater Co., 16-111w-18n	130.0	98.0	3	18.0	27.0		45.0				
Red Desert, Sweetwater Co., 7-19n-96w	40.0	22.0	7				40.0				
Ralston Processing Associates Inc.—Oregon Basin, Park Co., 8-51n-100w	15.0	6.5	7		2.5		2.6			1.4	
Sierra Energy Co.—Badger Basin, Park Co., 4-56n-101w	1.0	0.7	12/2						1.0		
Sonet Exploration—Powell, Converse Co., 38-39-40n 73&74w	40.0	36.0	3					36.0			
Sterling Energy Corp.—Morton, Converse Co., 5-35n-71w	1.8	1.3	3		2.1				2.9		
Union Pacific Resources—Brady, Sweetwater Co., 11-16n-101w	65.0	57.0	19/2		12.5	6.2	14.1			11.3	
Emigrant Trail, Uinta Co., 1-16n-113w	60.0	50.0	7						78.5		
Patrick Draw, Sweetwater Co., 25-19n-99w	25.0	22.0	7	3.9	16.1	3.4	5.6			6.8	
Unocal—Worland, Washakie Co., 17-48n-92w	15.0	12.9	7		12.4		7.4			4.9	
Western Gas Processors Ltd.—Amos Draw, Campbell Co., se 1/4 nw 1/4 32-1n-75w	30.0	12.1	2						28.7		111.6
Hartzog Draw, Campbell Co., nw 1/4 ne 1/4 11-48n-76w, 8th PM	25.0	12.7	3						15.7		113.2
Hilgert, Campbell Co., 26 sw14-45n-71w	30.0	4.4	3		9.6		8.6			5.7	116.3
Kitty, Campbell Co., 18-50n-73w	17.0	4.4	2		19.8		13.2			10.0	
Lincoln Road, Sweetwater Co., 107 w17n	45.0	20.5	3						34.0		
Newcastle, Weston Co., n2-nw4 9-42n-64w	5.0	2.5	3		7.6		8.3				110.9
Oedekoven, Campbell Co., 45 55n-73w	6.5	4.4	3								110.1
Spearhead, Converse Co., 13-79n-75w	18.0	7.0	3						15.0		
Total	3,600.3	2,843.4		21.9	283.4	9.6	216.1	64.3	2,516.5	146.5	1,145.4

ABU DHABI

Abu Dhabi Gas Industries Ltd.—											
*Asab NGL extract, Western Region	306.0	180.0	2-7								
Bab	117.0	NR	2-7								
*Bu Hasa NGL extract, Western Region	396.0	284.0	2-7								
Ruwais NGL			†								
Abu Dhabi Gas Liquefaction Co. Ltd.—											
Zakum, Umm Shaif, Bunduo, Das Island	450.0	465.0	1-3-4 5-6								
Abu Dhabi National Oil Co.—											
Haibhan, Thamama C onshore area	450.0	340.0	7/1							546.0	
Total	1,719.0	1,269.0								546.0	

†Fractionation. 22,000 tons day NGL capacity.

ALGERIA

Sonatrach—Camel plant, Arzew	NR	170.0	4-7					216.6			
Haasi R'Mel, Laghouat, Module 0	NR	1,578.0	NR								
Haasi R'Mel, Laghouat, Module 1	NR	2,085.2	6								112,309.0
Slakda	NR	435.0	4-7					414.2			113,140.2
Total	5,335.2	4,268.2						632.8			5,449.2

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
ARGENTINA											
Gas del Estado—Cañadón Alfa, Tierra del Fuego	52.9	74.6	131-3-4	.....	.....	.....	.....	.....	.....	17.7	.....
Cañadón Piedras, Tierra del Fuego	52.9	45.2	131-3-4	.....	.....	.....	.....	.....	.....	7.9	.....
Cañadón Seco, Caleta Olivia, Santa Cruz	17.7	21.2	131-1-2	.....	6.4	.....	7.6	.....	.....	5.3	.....
Caimanillo, Ledesma, Santa Cruz	35.3	56.5	131-1-2	.....	11.9	.....	12.9	.....	.....	6.7	.....
Centenario, Neuquén	17.7	17.7	131-1-2	.....	8.2	.....	8.6	.....	.....	7.3	.....
Chimen Aike, Rio Gallegos, Santa Cruz	28.2	28.2	351-3	.....	.....	.....	.....	.....	.....	14.7	.....
El Huemul, Pico Truncado, Santa Cruz	63.6	35.3	351-4	.....	.....	.....	.....	.....	.....	.....	.....
El Medanto, Colonia Catriel, Neuquén	45.9	21.2	351-3-4	.....	.....	.....	.....	.....	.....	8.7	.....
Loma de la Lata, Neuquén	211.9	222.5	25-7	.....	102.1	.....	67.5	.....	.....	85.4	.....
Planta McKee, Buenos Aires	176.6	155.4	131-1-2	.....	25.0	.....	26.0	.....	.....	30.0	.....
Planta Etano, Buenos Aires	635.6	679.0	4-235-7	687.7	343.6	.....	212.2	.....	.....	95.2	.....
Piazza Huincul, Cutralco, Neuquén	17.7	17.7	3-4-315	.....	.....	.....	.....	.....	.....	110.6	.....
Rio Neuquén, Neuquén	105.9	109.5	4-315	.....	.....	.....	.....	.....	.....	40.9	.....
Sierra Barrosa, Neuquén	26.5	15.9	4-315	.....	.....	.....	.....	.....	.....	.....	.....
Total	1488.4	1,498.9		687.7	497.2	.....	334.6	.....	.....	319.8	0.8
AUSTRALIA											
Esso Australia Ltd.—											
Gippsland No. 1, Longford, Victoria	370.0	170.0	192	93.0	147.0	.....	83.0	.....	.....	182.0	.....
Gippsland No. 2, Longford, Victoria	367.0	170.0	7	93.0	147.0	.....	83.0	.....	.....	182.0	.....
Gippsland No. 3, Longford, Victoria	370.0	170.0	7	93.0	147.0	.....	83.0	.....	.....	182.0	.....
Santos Ltd.—Moomba, Cooper Basin	666.0	466.0	141-235-7	.....	.....	.....	.....	610.3	.....	512.5	.....
Woodside Offshore Petroleum PL—											
Withnell Bay, Burrup Peninsula, Karratha, n of w Australia	560.0	400.0	7	.....	.....	.....	.....	.....	.....	11850.0	.....
Total	2,333.0	1,376.0		279.0	441.0	.....	249.0	610.3	.....	1,068.5	850.0
AUSTRIA											
OeMV AG—Aderklaa, Lower Austria	17.5	13.7	7	.....	.....	.....	.....	26.7	.....	28.4	.....
BAHRAIN											
Bahrain National Gas Co.—Jebel Al-Dukhan	168.0	155.0	192	.....	.....	.....	.....	25.6	.....	.....	.....
Total	168.0	155.0		.....	.....	.....	.....	25.6	.....	.....	.....
BANGLADESH											
Bakhrabad Gas Systems Ltd.—											
*Muradnagar Upazilla-1, Comilla District	60.0	58.0	351	.....	.....	.....	.....	.....	.....	.....	.....
*Muradnagar Upazilla-2, Comilla District	180.0	120.0	31-32 5	.....	.....	.....	.....	.....	.....	118.2	.....
Total	240.0	178.0		.....	.....	.....	.....	.....	.....	8.2	.....
BOLIVIA											
Yacimientos Petroleros Fiscales Bolivianos—											
Colpa plant, Andres Ibanez Province, Santa Cruz	192.0	18.0	131	.....	.....	.....	.....	7.8	.....	5.7	111.0
*Rio Grande plant, Cordillera Province, Santa Cruz	282.0	159.3	131	.....	1.4	2.5	.....	153.9	.....	55.8	1125.9
Total	474.0	177.3		.....	1.4	2.5	.....	161.7	.....	61.5	136.9
BRAZIL											
Petrobras—											
Asfor, Ceará	12.4	5.1	472	.....	.....	.....	.....	15.3	.....	<0.1	.....
Atalaia, Sergipe	70.6	96.3	472	.....	.....	.....	.....	0.2	.....	53.6	.....
*Cabiúnas, Rio de Janeiro	19.8	19.5	472	.....	.....	.....	.....	.....	.....	.....	.....
Cabiúnas, Rio de Janeiro	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....
Cardenas, Bahia	70.6	84.3	472	.....	.....	.....	.....	.....	.....	.....	.....
Carmópolis, Sergipe	12.4	7.5	6	.....	.....	.....	.....	.....	.....	.....	.....
Catu, Agua Grande, Bahia	49.4	57.0	472	.....	.....	.....	.....	.....	.....	2130.4	.....
Guamaré, Rio Grande do Norte	70.6	69.1	472	.....	.....	.....	.....	.....	.....	25.8	.....
Lagoa Parada, Espírito Santo	5.3	10.7	3	.....	.....	.....	.....	139.7	.....	28.0	292.1
*Rio de Janeiro I	70.6	65.9	472	.....	.....	.....	.....	8.2	.....	4.0	.....
Rio de Janeiro II	70.6	40.8	7	.....	8.0	.....	.....	107.3	.....	22.1	10.4
Total	452.3	456.2		8.0	.....	.....	.....	313.0	.....	118.4	228.7
1396,300 g/d gas capacity, 66,050 g/d throughput. Stabilization process.											
BRUNEI											
Brunei Shell Petroleum Co. Sdn. Bhd.—Seria	82.0	67.4	4	.....	.....	.....	.....	.....	.....	.....	.....
Brunei LNG Sendirian Berhad—Lumut	1,050.0	800.0	6	.....	7.9	.....	.....	.....	.....	265.0	.....
Total	1,132.0	867.4		.....	7.9	.....	.....	.....	.....	265.0	.....

Canada

Alberta

AEC Oil and Gas.—

Craigend, 9-25-64 14 wfm	18.0	18.0	351-4	.....	.....	.....	.....	.....	.....	.....	.....
Edward, 16-36-62-16 wfm	15.0	12.0	351-4	.....	.....	.....	.....	.....	.....	.....	.....
Hythe-Brinard, Sour 14-18-74 12 wfm	75.0	50.0	33-351-4	.....	.....	.....	.....	.....	.....	.....	.....
*Hythe-Brinard, Sweet 11-18-74-12 wfm	55.0	18.0	351-4-6	.....	.....	.....	.....	0.4	.....	.....	.....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Island Lake, 10-21-67 24 w4m	4.0	2.5	35-1-4								
Keg River, 7-12-103 24 w5m	35.0	17.0	35-1-4								
Primrose North, 12-1-73-6 w4m	35.0	35.0	35-1-4								
*Suffield A1 Station, 4-3-19-9 w4m	30.0	11.0	35-1-4								
Suffield A2 Station, 16-15-20-8 w4m	20.0	8.0	35-1-4								
Suffield AB Station, 16-16-20-6 w4m	30.0	12.0	35-1-4								
Suffield B1 Station, 14-15-20-5 w4m	25.0	13.0	35-1-4								
Suffield B2 Station, 14-15-20-4 w4m	50.0	24.0	35-1-4								
Suffield C Station, 1-4-15-8 w4m	50.0	34.0	35-1-4								
Suffield D Station, 1-4-15-6 w4m	70.0	40.0	35-1-4								
Suffield E Station, 4-3-18-9 w4m	25.0	17.0	35-1-4								
Suffield Koomati Station, 4-4-17-4 w4m	120.0	60.0	35-1-4								
Tweedie, 11-5-68 12 w4m	19.0	7.0	35-1-4								
Valhalla Solution, Grande Prairie, 16-18-74-06 w4m	6.0	3.0	4								
Alberta Natural Gas Co. Ltd.—											
*Cochrane, ne 1/4, 16-26-4 5w5m	1,300.0	1,300.0	6-7	1,715.0					655.0		
Altana Exploration Co.—											
Caroline, 12-36-34-6 w5m	12.0	6.0	192					9.0			
Monitor, 10-3-35-4 w4m	10.0	5.0	4								
Niton, 10-16-55-13 w5m	5.0	1.0	3					0.5	0.5		
Saddle Lake, 16-26-57-13 w4m	5.0	2.0	4								
Atlas Resources Ltd.—											
Bittern Lake, 11-27-46-21 w4m	10.8	3.8	3						1.2		
Delburne, LSD 10-8-37-23 w4m	18.0	10.4	3-4						9.6		
Penhold, LSD 10-30-36-27 w4m	6.5	2.2	3-4						2.3		
Provost (Monitor), 2-3-35-5 w4m	6.0	0.5	3-6								
Amoco Canada Petroleum Co. Ltd.—											
Ante Creek-1, nw 18-65-23 w5m	10.0	1.3	191-3-4						9.6		
Ante Creek 4-13, LSD 4 13-65-24 w5m	2.0	0.8	3							0.1	
Ante Creek Dunvegan-3, LSD 10 4-66-23 w4m	10.0	2.2	3						1.7		
Arrowwood North, 4-15-21-25 w4m	7.9	2.1	4								
Arrowwood South, Hussar, 1-7-20-25 w4m	24.9	4.1	4								
Athabasca East, 9-23-66-22 w4m	9.0	4.2	4								
Atlee-Buffalo, 12-21-20-6 w4m	4.0	0.7	4								
Baptiste (Athabasca N.), 5-18-67-22 w4m	11.3	2.1	7-1-4								
Baptiste, 8-18-68-23 w4	4.0	0.8	21-1								
Big Bend, 2-7-67-26 w4	10.0	2.3	3								
Bigoray (Pekisko), 6-28-51-9 w5m	13.2	5.5	21-3							1.6	
*Bigoray 13-9, 13-9-52-8 w5m	1.7		3						9.7		
Bigstone D-3, sw 1/4 10-61-22 w5m	55.7	32.0	331-3-4								
Bigstone Dunvegan, se 10-61-22 w5m	18.0	17.8	3-4						35.2		
Bolloque, 16-23-64-26 w4m	10.0	2.3	4								
Bouvier, 15-29-70-24 w4m	5.2	0.8	21-4								
Braeburn, 16-19-77-10 w6m	5.6		7-1-4								
Brazeau (Elk River), 4-6-47-12 w5m	7.0	1.7	7-131-3-4						0.3		
Brazeau River, 1-46-14 w5m	218.2	83.5	7-1-3						41.0		
Cache, 1-32-59-13 w4m	15.0	6.5	131-4								
Caroline North, 1-11-35-6 w5m	74.3	40.9	19-20-1-3		22.4	21.1				35.1	
Caroline South, 3-20-34-4 w5m	47.7	26.2	7-131-2		14.9	16.9				28.0	
Cessford, 2-8-24-12 w4m	128.0	23.6	3-4							3.2	
Cherhill, 4-24-56-5 w5m	7.0	5.3	7-1-2						6.5		
Craigend, 16-1-64-13 w4m	5.0	2.5	4								
Cranberry, 1-24-96-5 w6m	88.3	43.1	7-131-3-4						40.5	59.7	
Duvernay, 11-11-55-12 w4m	14.6	3.0	4								
Eaglesham, 2-14-77-25 w5	4.0	1.9	2-3						1.6		
D-1, East Crossfield, n 1/4 14-28-1 w5m	105.9	48.9	331-3-4						3.4	12.3	
East Crossfield, ne 1/4 14-28-1 w5m	45.0		3-4								
Edson, 3&4 11-53-18 w5m	372.5	125.0	7-131-3-4							47.6	
Edward, 7-12-62-17 w4m	2.5	0.5	4								
Ellerslie, sw 1/4 4-52-25 w4m	315.0	155.6	3-4	459.1	212.7	78.7				37.5	
Empress I & II, sw 1/4 12-20-1 w4m	3,500.0	2,800.0	25-7	1,962.5	745.8	283.4				119.9	
Enchant, 11-9-14-16 w4m	7.0	6.0	4								
Fir, ne 1/4 32-58-21 w5m	60.0		131								
Fiat Lake, 11-17-67-18 w4m	6.5	1.1	4								
Frenman, 11-21-64-9 w4m	9.0	4.6	131-4								
Garrington, 11-17-34-3 w5m	15.0	5.2	131-3-4		10.6	5.8			2.5		
Gilby North, 9-12-41-4 w5m	4.2	1.2	131-3-4							0.7	
Gilby South, 8-26-40-3 w5m	6.4	4.6	4-15							2.1	
Granada, Pembina, LSD 2 18-52-11 w5m	30.0	17.0	3						25.8	0.3	
Haight Mundare, 6-8-53-16 w4m	7.0	1.7	4								
Hilda, 16-22-17-2 w4m	6.0	2.7	4								
Hollow, 10-22-61-20 w4m	10.0	2.7	4								
Hotchkiss East, 6-6-94-1 w6	12.7	1.5	131-4								
Hotchkiss MD, 11-29-94-25 w5m	191.1	8.1	4								
Hotchkiss North, 2-35-94-2 w6m	22.6	13.4	331-4								
Hotchkiss South, 9-34-93-01 w6m	22.1	3.3	4								
Hyla, 12-65-15 w4m	3.3	1.5	131-4								
Inland, 4-25-51-15 w4m	7.5	2.2	131-3-4							10.8	
Inland South, 15-31-50-14 w4m	9.0	1.6	4								
Jenner, 10-34-19-9 w4m	14.0	7.5	7-131-3-4								
Josephine, ne 1/4 1-83-10 w6m	50.0	8.7	3							5.0	
*Kaybob South 1, 1-12-62-20 w5m	225.6	81.6	7-131-3-4		118.3	74.5				162.8	
*Kaybob South 2, 3&4 12-62-20 w5m	169.1	24.5	7-1-3-4						91.6	118.4	
Kaybob South (West Fox Creek), 13-22-60-19 w5m	15.7	5.6	3						3.2		
Kirby, nw 25-73-5 w4m	53.0	33.2	131-4								
Kirby Lake, 12-8-74-5 w5m	44.8	29.2	4								
Lansway, 13-5-36-4 w5m	15.0		131-4								
Levoy, 11-12-52-14 w4m	15.9	4.7	4								
Leaman, 4-10-56-11 w5	17.7	7.1	3						5.7	2.4	
Leismer, 21 77-8 w5m	27.0	27.2	131-4								

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Nor al or unsplif butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Little Bow, 16-13-14-18 w4m	20.0	5.3	7-13 1-3-4							0.6	
Lobstick, sw 1/4 17-50-7 w5m	44.1	32.2	3-4						28.7	1.1	
Lone Pine Creek, 6-23-30-28 w4m	74.0	15.4	7-13-4							24.4	
Majorville, 4-31-18-19 w4	10.8	8.9	3							1.9	
Mannville, 3-27-50-9 w4m	33.9	11.5	4								
Markerville, 10-6-36-2 w5m	15.0		19 1								
Marten Hills, 18-76-25 w4m	142.3	31.9	4-25								
Meanook, 6-10-63-22 w4m	26.5	3.7	12-14								
Medicine Hat, 2-27-15-4 w4m	12.0	4.3	4								
Medicine Hat North, 1-7-16-2 w4m	4.5	2.2	14								
Medicine River, 6-16-38-4 w5m	6.5	4.0	3-4		0.5	1.2				1.6	
*Nipisi, 4 11-80-8 w5m	44.1	0.4	20 1-3						158.1	0.6	
Nipisi (Mitsue), 12-30-72-4 w5	25.0		3-4-6								
Oyen, 14-38-28-5 w4	4.0	0.6	3-4								
Patricia, 13-5-21-12 w4m	7.9	1.5	4								
Pembalta 1, ne 1/4 25-48-7 w5m	8.2	4.8	3-4								
Pembalta 2, e 1/4 15-47-7 w5m	16.0	10.4	3-4								
Pembalta 7, sw 1/4 34-47-9 w5m	13.7	6.6	3-4								
Pembalta 8, sw 1/4 5-49-9 w5m	10.9	2.5	3-4								
Pembina, 10-25-45-9 w5	1.0	0.6	3						0.5		
Pembina (Keystone), 6-15-48-3 w5m	7.5	4.1	3-4		2.6	3.4				3.1	
Pouce Coupe, 11-19-79-11 w6	11.7	8.8	3							6.0	
Provost, 13-9-33-8 w4	1.7	0.5	3								
Provost, ne 1/4 19-36-5 w4m	80.0	22.8	5								
Provost (Amisk), 1-22-41-8 w4m	10.0	1.2	3-4							<0.1	
Provost (Brownfield), se 1/4 2-39-12 w4m	10.6	11.5	3-4-5							1.2	
*Provost (Castor East), 4-3-38-13 w4m	19.9	6.3	4-5							0.4	
Provost (Choice), 13-17-40-9 w4m	10.0	1.6	4-5							0.1	
Provost (Consort), 8-19-36-5 w4m	75.8	21.3	13-14							3.7	
Provost East, 3-30-37-2 w4m	9.5	4.0	3							0.6	
Ranfurly, 14-32-50 12 w4m	15.9	15.9	4								
Richdale, 7-9-12 w4m	10.0	4.0	3-4							0.4	
*Ricinus, 11-30-35-8 w5m	22.2	39.6	3-4		96.0	53.0				61.1	
Route, 7-16-62-8 w6m	70.0	12.5	12-4						7.0		
Sinclair, sw 1/4 19-72-11 w6m	70.0	32.8	13-14							9.8	
St. Albert, 14 36-53-26 w4m	2.0	0.1	7-13 1-3-4						1.5		
South Wapiti, ne 3/4 6-67 9 w6m	298.4	188.3	9-32 5							39.3	
Steele, 10-19-77-24 w4m	8.9	2.3	13-23 1-5								
Sturgeon Lake South, se 2-69-22 w5m	22.8	11.2	31-14						8.5	13.3	
Sundance, 6-25-54-21 w5m	15.6	15.1	3							9.8	
Sundance, 7-9-54-21 w5	6.0	2.3	3-15 5							<0.1	
Sylvan Lake, 10-12-38-3 w5m	4.0	1.4	3		0.3	0.4				0.6	
Sylvan Lake, 14-32-37-3 w5m	54.0	26.4	7-13		23.2	1.6				11.2	
Tangent, 16-20-80-24 w5m	7.5	2.7	7-13-4								
Three Hills Creek, nw 1/4 13-35-28 w4m	12.0	3.6	3-4						6.1		
Tower North, 6-14-76-16 w4m	7.0	4.3	4								
Twining, sw 31-32-24 w4m	8.3	4.5	3							5.1	
Valhalla, 1-29-75-9 w6m	31.8	21.2	3-4							3.3	
Vulcan, se 1/4 24-15-22 w4m	55.2	30.6	21 1-7-33 2							7.3	
Wandering River, 9-30-72-14 w4m	11.9	1.0	4								
Warwick, 10-18-53-14 w4m	8.4	2.1	4								
Waskahigan, ne 7-64-23 w5m	16.3	10.8	13-14						7.7		
Wembley, 6-19-73-8 w6	99.0	22.9	7-13						57.4	129.6	
Whitelaw, 13-20-61-1 w6m	10.0	0.6	4								
*Willesden Green, 27-42-8 w5m	40.0	21.6	3-7		12.9	12.7				8.9	
*Windfall, 8-17-60-15 w5m	421.6	84.0	7-13-4							66.4	
Worsley, 7-22-67-7 w6m	56.7	0.5	19-13							0.6	
Zama, nw 12-116-6 w6m	25.6	8.4	7-13 1-2-4						8.2	8.0	
Anderson Exploration Ltd.—											
Belloy, 13-16-78-1 w6m	20.0	15.0	3-4						2.5	1.0	
Bruce, 10-1-48-15 w4m	3.0	1.0	4								
Buff Coulee, 11-12-47-7 w4m	8.0	7.5	4								
Dixonville, 8-14-85-25 w4m	4.0	1.0	4								
Donnelly, 6-1-77-21 w5m	3.5	3.0	21-3-4								
Dunvegan, 15-3-81-4 w6m	240.0	140.0	3-7						85.0	0.1	
Hines, LSD 6-35-85-3 w6m	8.0	7.5	4-28 5							38.0	
Kitscoty, 10-17-51-3	2.0	2.0	4								
Lloydminster, 7-11-51-1 w4m	2.0	1.5	4								
Manyberries, 10-1-5-5 w4m	2.5	1.8	4								
Normandville, 13-9-79-22 w5m	4.0	3.0	3-4							<0.1	
Paradise, Omega, 8-24-46-02 w4m	5.0	4.7	4								
Whitelaw, 7-33-1-1 w6m	1.0	1.0	4								
Wildmere, 7-2-49-6 w4m	20.0	20.0	4								
Windy, 11-22-49-4 w4m	1.5	1.0	4								
Woking, 11-30-75-4 w6m	4.5	1.8	3-4								
Atlantis Resources Ltd.—											
Crossfield, 4-2-30-3 w5	4.0	3.0	3-4					<0.1			
Einora, 4-29-34-23 w4	5.0	4.0	3-4					0.1			
Husley North, 7-6-35-24 w4	4.0	2.0	3-4					<0.1			
Husley Unit, 6-17-34-24 w4	8.0	2.4	1					<0.1			
Three Hills Creek, 13-13-35-26 w4	12.0	12.0	3-4					0.5			
Trochu, 4-31-32-23 w4	10.0	9.0	3-4					0.2			
Ausquegan Energy Ltd.—Bantry, LSD 4											
33-17-12 w4m	12.4	5.5	2	<0.1	0.3		0.8			2.7	
Bumper Development Corp. Ltd.—Bumper											
Crystal, Wetaskiwin, 16-36-45-4 w5m	4.0	1.5	3						3.0		
Bumper Rose Creek, Wetaskiwin,											
8-13-45-7 w5m	5.0	3.5	15 5								
Canadian Hunter Exploration Ltd.—											
Basset Station 1, ne 1/4 29-104-2 w6m	7.0	3.6	32 5							0.1	

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Basset Lake South, ne 1/4 29-106-5 w6m.....	4.0	2.7	3					233.0		0.1	
Elmworth Deep Cut, se 1/4 8-70-11 w6m.....	275.0	155.0	7							21.5	
Elmworth Shallow Cut, se 1/4 8-70-11 w6m...	300.0	190.0	31.5							0.1	
Haig River, nw 1/4 33-104-5 w6m.....	5.4	2.3	3							26.2	
Karr, nw 1/4 10-65-2 w6m.....	50.0	31.0	3		8.2		9.5			79.5	
Karr, 10-10-65-2n6m.....	71.0	80.0	7		139.9					26.0	
Noel, 6-59-93-8-1.....	150.0	120.0	1							0.6	
South Gold Creek, nw 1/4 15-66-5 w6m.....	15.0	1.9	35.1								
Canadian Natural Resources—											
Cailing Lake South, 1-20-70-20 w4m.....	10.0	4.3	7-35.1-4								
Killam, Flagstaff 29, LSD 12-23-42-11 w4m.....	20.0	1.0	4-31.5					<0.1			
Canadian Occidental Petroleum Ltd.—											
Carrot Creek, 2-26-52 12 w5m.....	14.0	9.0	3					\$15.2			
Keystone, 5 35-46-4 w5m.....	10.0	4.0	2		1.8		1.8			1.9	
Mazeppa, se 1/4 35-19-28 w4m.....	45.0	14.0	39.2							17.7	
Oktoks, MD 31, Foothills, sw 1/4 27-20-29 w4m.....	34.8	24.6	21.1-5.5							11.9	
Paddle River, LSD 13, 6-57n-8 w5m.....			71-7	10.9	16.9		9.5			7.3	
Petrogas Processing, Crossfield, s 1/2 2-26-29 w4m.....	210.0	74.0	7.1		34.3		24.3			44.9	
Canor Energy Ltd.—											
Buffalo Lake North, LSD 11-24-41-21 w4m.....	7.0	2.0	35.1-3							0.1	
Hanna, 2-36-31-14 w4m.....	2.5	2.0	35.1-3							0.2	
Neslow, 16-26-60-24 w4m.....	8.0	2.0	35.1-3								
North Sibbald V.S., 11-23-31-2 w4m.....	5.0	1.4	35.1								
North Sibbald-Canmer, 6-9-31-1w4.....	7.0	1.6	35.1-4							35.1-4	
Viking, 11-17-47-9 w4.....	2.0	1.0	35.1-3							<0.1	
Chevron Canada Resources—											
*Acheson, 5-2-53-26 w4m.....	17.7	6.0	7	3.5	4.4		2.7			1.5	
*Bigoray, 10-7-51-9 w5m.....	3.0	NR	31-3-4								
*Brazear, 16-35-48-12 w5m.....	24.8	16.4	3-4						35.4		67.5
Chinchaga, 5-32-98-7 w6m.....	30.0	18.0	3-13.1-4								
Ferrybank, 14-11-45-27 w4m.....	5.2	4.0	3-4						3.0		
Joffre, 14-36-38-27 w4m.....	9.0	0.5	3-4						0.7		
House Algar, 16-1-82-17 w4m.....	7.5	2.7	4								
*Kaybob South No. 3, 15-59-18 w5m.....	445.0	303.5	31-19.2-4					89.3		274.6	5340.8
*Mitsue, 11 30-72-4 w5m.....	30.2	33.0	19.2-4						349.8		
North Gilby, 1-24-41-3 w5m.....	23.0	9.3	3-32.5					11.0			
Pouce Coupe, 6-30-79-11 w6m.....	19.9	11.4	3-4					9.1			
Princess, 12-12-20-12 w4m.....	13.0	4.6	31-32.5							0.6	
Sylvan Lake, 1-21-38-2 w5m.....	31.5	17.7	19.2		16.8		11.3			9.4	
*West Pembina, 11-22-49-12 w5m.....	32.0	21.8	31-3-4					30.2		32.9	
Chieftain Development Co. Ltd.—											
Chisholm, 11-2-69 1 w5m.....	4.0	4.0	35.1								
Cooperative Energy Development Corp.—											
Blackie, 06-15-20-27 w4m.....	4.0	1.0	13-26.2-4						1.0		
Carrot Creek, LSD 10-16-53-13 w5m.....	8.0	6.0	13-26.2-4						8.0		
Edson 1-13, LSD 1-13-54-19 w5m.....	10.0	6.0	13-26.2-4						9.0		
Edson North, LSD 16-15-53-18 w5m.....	8.0	4.5	13-26.2-4						5.6		
Edson South, 10-30-52-17 w5m.....	1.5	1.0	13-26.2-4						1.5		
Iosegun 4-15, LSD 4-15-65 20 w5m.....	6.0	4.0	13.1								
Iosegun 10-23, LSD 10-23-65-20 w5m.....	10.0	8.0	13.1								
Iosegun 10-27, LSD 10-27-65-20 w5m.....	6.0	4.0	13.1								
Medicine River, LSD 10-14-39-3 w5m.....	6.0	6.0	13-26.2-4						7.5		
DeKalb Petroleum Corp.—											
Blueberry Mountain, 11-16-82-7 w6m.....	10.0	5.0	5							1.5	
Bingley, 2-36-40-7 w5m.....	2.6	2.6	6						4.0		
Garrington, 13-5-34-3 w5m.....	12.0	5.0	7						6.5		
Leafland, 15-31-39-5 w5m.....	23.5	10.0	7						13.0	13.0	
Nevis, 12-7-41-22 w4m.....	27.0	10.0	11.1								
D.M. Wolcott & Associates Ltd.—											
Empress, SE 1/4 10-20-1 w4m.....	350.0	350.0	7	264.2				145.3			
West Pembina, 10-47-14 w5m.....	95.0	75.0	3					52.8		211.3	
Enron Oil Canada Ltd.—											
Greencourt East, 9-20-59-6 w5m.....	9.0	9.0	3		1.5	0.4	1.3	4.8		1.8	
Highvale, 10-4-51-4 w5m.....	7.5	5.2	3		0.7	0.3	0.7	2.4		0.6	110.5
Eso Resources Canada Ltd.—Battle Lake,											
3-23-46-2 w5m.....	1.8	0.3	53-5					0.1			
Big Bend, 13-36-66-27 w4m.....	35.0	14.6	19.1								
*Bonnie Glen - Solution, sw 17-47-27 w4m.....	68.7	50.6	73-5	206.8	207.1	107.3	72.3	1.2			
*Bonnie Glen - Cycle, sw 17-47-27 w4m.....	118.5	0.0	73-5		48.5	25.3	64.4				
Boundary Lake South, Floral, 1-14-85-13 w6m.....	17.0	6.6	19.1-3						2.2		
Castor, 4-3-38-13 w4m.....	1.5	0.4	13.1-6								
Comet Galaxy, Rainbow Lake, 12-23-110-7 w6m.....	8.0	5.7	19.5-3								
Countess, 8-36-20-16 w4m.....	4.5	1.5	4								
Cynthia, 13-22-49-10 w5m.....	8.0	5.3	19.5-5					2.2	6.8		
*Devon—1 and 2, 34-50-26 w4m.....			1		(138.7)		(89.8)			(69.4)	
Everdell, Ferrier 14-20-38-7 w5m.....	10.0	9.0	3-4							13.3	
Golden Spike, 16-22-51-27 w4m.....	126.0	2.1	4	1.0	5.4	3.5	3.6			3.7	
Hornbeck, 16-7-54-19 w5.....	20.1	9.6	3								
Irish, 16-36-54-6 w4m.....	15.0	2.8	11.1-4							3.9	
Joarcam, 11-3-49-21 w4.....	7.6	2.8	3-4								
Joffre D2, Lacombe, ne 1/4 17-39-26 w4m.....	7.5	4.4	19.1-3-4		7.0	3.6	1.4				
Judy Creek, 10-25-64-11 w5m.....	265.0	145.9	1-2-3						798.1		
*Leduc, Devon, 34-50-26 w4m.....	35.0	101.8	19.5-3	152.4	112.8	44.0	36.2				
Magee, Chigwell, 11-20-42-3 w5m.....	7.0	5.6	3					3.6			
Medicine Hat-Roseglen, 4-1-16-3 w4m.....	20.0	5.7	11.1								

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Niton, LSD 14-18-54-12 w5m.....	50.0	15.5	3	....	....	....	....	....	14.7	....	....
Open Creek, Wilson Creek—											
9810-34-42-5 w5m.....	7.1	3.6	⁵ 3-5	....	....	....	....	5.3	....	....	....
Quirk Creek, s½ 4-21-4 w5m.....	90.0	64.8	3-5	....	....	....	....	84.4	....	....	....
Redwater, LSD 8 29-57-21 w4m.....	22.1	3.9	¹⁹ 5-2	....	10.4	7.1	3.8	....	....	....	....
Runsey/Rowley, 8-36-33-21 w3m.....	10.0	5.2	3	....	....	....	2.2	....	....	....	....
Sundance, 4-36-54-21 w5.....	15.5	13.9	3	....	....	....	....	....	11.9	....	....
Swan Hill, 3-18-67-10 w5m.....	52.0	36.7	¹⁹ 1	....	....	....	....	....	....	....	....
Wapiti, 4-8-69-8 w6m.....	125.0	54.8	3-4	....	....	....	7.6	....	....	....	....
Wapiti Deep Cut, 4-8-69-8 w6m.....	320.0	175.6	3-4	....	....	....	....	....	256.9	....	....
			²¹ 5-6-7								
Willesden Green, 1-17-42-6 w5m.....	22.8	9.4	3	....	....	....	4.7	11.7	....	4.7	....
Gulf Canada Resources Ltd.—											
Baptiste, LSD 5-28-67-22 w5m.....	10.4	2.3	¹⁵ 1	....	....	....	....	....	....	....	....
Gilby, Gilby, 15-22-40-3 w5m.....	51.0	16.7	⁷ 2-4-5	....	12.3	....	7.1	....	....	9.1	....
Hanna, LSD 2-36-31-14 w4m.....	3.0	0.4	3	....	....	....	....	....	....	0.1	....
Hanlan-Robb, ne¼ 2-49-20 w5m.....	304.0	190.1	¹ 2	....	....	....	....	....	....	4.8	....
Island Lake, 1-18-68-23 w4m.....	5.2	1.2	²¹ 1-4	....	....	....	....	....	....	....	....
Morin-Ghost Pine, LSD 1, 8-11-31-21 w4m.....	109.4	52.5	3-4	....	....	....	....	....	....	0.7	....
Nevis, ne¼ 9-33-38-22 w4m.....	124.3	80.2	²¹ 2-4	....	63.4	53.5	....	....	....	47.3	....
Nordegg River (Braceau R),											
LSD 8-10-44-12 w5m.....	55.0	35.4	²¹ 1-4-5	....	....	....	....	....	....	16.0	....
Rimbey, LSD s½ 5-44-1 w5m.....	421.0	254.4	²¹ 2-4	....	265.4	140.9	....	....	....	163.6	....
Strachan, LSD 11-35-37-9 w5m.....	275.0	143.5	7	....	....	....	....	....	113.6	116.1	....
West Drummheller, 12-1-30-21 w4m.....	3.4	1.4	²¹ 1-4	....	....	....	....	....	....	0.1	....
Home Oil Co. Ltd.—Bashaw,											
8-10-42-22 w4m.....	11.9	4.0	5	....	....	....	....	....	....	¹¹ <0.1	....
*Carstairs-Crossfield, 3-3-30-2 w5m.....	280.0	100.0	2	....	67.2	....	48.3	....	....	100.8	¹¹ 8.0
Cossack, 7-17-60-17 w4m.....	6.0	0.2	¹³ 1-4	....	....	....	....	....	....	....	....
Leismer, 6, 7-77-7 w4m.....	40.0	29.5	¹³ 1-4	....	....	....	....	....	....	....	....
Marten Hills South-1, 14-22-74-24 w4m.....	21.0	9.7	¹³ 1-4, ¹⁵ 5	....	....	....	....	....	....	....	....
Marten Hills South-2, 14-29-74-25 w4m.....	8.0	0.8	¹³ 1-4	....	....	....	....	....	....	....	....
Retlaw, 12-2-13-19 w4m.....	10.0	3.6	5	....	....	....	....	....	....	0.4	....
South Elton, 2-3-31-4 w5m.....	8.0	4.8	3	....	....	....	....	....	....	3.0	....
Tieland, 5-14-67-2 w5m.....	10.0	3.1	¹³ 1-4-5	....	....	....	....	....	....	....	....
Husky Oil Operations Ltd.—											
Baxter Lake, 11-22-46-5 w4m.....	0.6	0.4	³⁵ 1-4	....	....	....	....	....	....	....	....
Buffalo Coulee, 7-24-46-7 w4m.....	4.2	4.0	4	....	....	....	....	....	....	....	....
Cessford, Special Area 3, LSD 4-6-24-10 w4m.....	13.5	5.7	⁴ 3-5	....	....	....	....	....	....	....	....
Consort (Provost), 7-34-34-6 w4m.....	10.0	1.6	³¹ 1-3-4	....	....	....	....	....	....	¹¹ 0.5	....
Eagle Wildmere, 29-48-6 w4m.....	5.7	3.4	³⁵ 1-4	....	....	....	....	....	....	....	....
Entice, se 24-28-24 w4m.....	6.0	4.6	³¹ 1-4	....	....	....	....	....	....	¹¹ 0.1	....
Ghost Pine, 10-4-32-23 w4m.....	2.4	1.2	3-4	....	....	....	....	....	....	¹¹ 1.5	....
Halkirk, 2-34-38-16 w4m.....	5.0	2.1	3	....	....	....	....	....	....	¹¹ 1.8	....
Killam, 10-27-42-13 w4m.....	5.0	1.2	²¹ 1-4	....	....	....	....	....	....	....	....
			³¹ 5								
Kitscoty, 18-50-2 w4m.....	0.8	0.5	³⁵ 1-4	....	....	....	....	....	....	....	....
Kitscoty South, 7-23-49-3 w4m.....	2.6	2.1	³⁵ 1-4	....	....	....	....	....	....	....	....
Hussar, 13-36-24-21 w4m.....	84.0	19.8	¹ 2-4	....	15.4	....	15.8	....	....	¹¹ 7.0	....
Judy Creek, 8-24-63 10 w5m.....	4.5	1.2	3-4	....	....	....	....	....	....	¹¹ 0.3	....
Leahurst, 15-18-40-18 w4m.....	10.0	0.7	³⁵ 1-4	....	....	....	....	....	....	¹¹ 0.3	....
Mannville, 32-52-7 w4m.....	3.4	2.3	³⁵ 1-4	....	....	....	....	....	....	....	....
North Oyen, 11-17-29 w4m.....	4.0	1.1	³¹ 1-4	....	....	....	....	....	....	....	....
North Wainwright, 16-15-46-6 w4m.....	8.5	7.0	³⁵ 1-4	....	....	....	....	....	....	....	....
Rainbow Lake, 10-10-109-8 w6m.....	104.0	95.7	⁷ 1-3-4	....	....	....	638.3	....	....	....	....
Ram River, 2-37-10 w5m.....	630.0	400.0	⁵ 5	....	....	....	....	....	....	32.5	....
Rivercourse, 8-47-1 w4m.....	2.8	1.9	³⁵ 1-4	....	....	....	....	....	....	....	....
Sinclair, 2-14-72-12 w6m.....	10.0	5.0	3	....	....	....	....	....	5.0	....	....
Vermilion South, 5-48-6 w4m.....	3.1	2.1	³⁵ 1-4	....	....	....	....	....	....	....	....
Veteran (Provost), 15-29-34-8 w4m.....	7.0	3.4	³¹ 1-3-4	....	....	....	....	....	....	¹¹ 1.3	....
Wayne Rosedale, 12-4-28-20 w4m.....	15.0	1.2	³¹ 1-3-4	....	....	....	....	....	1.6	¹¹ 1.0	....
Wildmere, 19-47-4 w4m.....	2.6	1.7	³⁵ 1-4	....	....	....	....	....	....	....	....
Wimbome, 16-5-35-26 w4m.....	3.8	1.0	3-4	....	....	....	....	....	....	....	....
ICG Resources Ltd.—											
Acheson, sw¼ 2-53-26 w4m.....	7.5	7.5	3	....	27.0	....	14.0	....	....	8.6	....
Chard, 16-1-79-5 w4m.....	5.3	5.3	4	....	....	....	....	....	....	....	....
Cowpor, 11-19-80-4 w4m.....	12.0	7.0	4	....	....	....	....	....	....	....	....
Gilby, 10-10-041-03 w5m.....	12.0	6.0	²⁸ 5	....	....	....	....	....	1.7	....	....
Hilda, 4-26-17 2 w4m.....	5.5	2.0	4	....	....	....	....	....	....	....	....
Leafland, 13-16-040-05 w4m.....	5.5	5.5	6	....	....	....	8.0	....	....	....	....
Many Islands, 4-16-14-1 w4m.....	28.0	20.0	4	....	....	....	....	....	....	....	....
Tweedie, se½ 19-68-12 w4m.....	15.0	7.5	4	....	....	....	....	....	....	....	....
Inverness Petroleum Ltd.—											
Boly LKS, 1-14-85-13 w5m.....	28.0	20.0	3- ⁸ 5	....	....	....	....	....	....	¹¹ 3.4	....
Gilby, 1-4-42-3 w5m.....	10.0	5.0	3	0.1	0.9	1.1	....	3.2	....	....	....
Jordan Petroleum Ltd.—Three Hills, LSD											
11-16-31-23 w4m.....	5.0	1.5	2	....	....	....	....	....	0.6	....	....
Kerr-McGee Corp.—											
Craigmyle, 13-5-32-17 w4m.....	6.2	6.2	²⁶ 3	....	....	....	....	....	2.2	2.0	....
Elmora, 5-19-35-22 w4m.....	18.0	15.0	³ 3	....	....	....	....	....	4.2	....	....
Ferrybank, 3-31-44-27 w4m.....	8.5	8.5	²⁶ 3	....	....	....	....	....	....	0.5	....
Rich, 16-22-35-21 w4m.....	3.0	2.0	²⁶ 3	....	....	....	....	....	....	0.5	....
Mid-West Gas Transmission Co. Ltd.—											
Fort Saskatchewan, se¼ 3-55-22 w4m.....	35.0	34.3	7	....	....	....	....	....	63.2	....	....
St. Albert, Sturgeon Dist., se¼ 3-26-54-25 w4m.....	20.0	13.8	¹⁹ 2	....	5.6	3.7	....	....	....	2.4	....
MLC Oil & Gas Ltd.—Berrymoor, Leduc, 5-35-49-6 w5m.....	7.5	6.4	3	0.7	2.9	0.8	1.4	....	....	2.1	....
Claresholm, MD of Wilson Creek, 15-36-12-27 w4m.....	9.7	6.8	3	<0.1	4.7	3.0	3.0	....	....	2.1	....
Redwater, Lamont, 15-16-56-20 w4m.....	1.1	0.2	3	....	....	....	....	....	....	<0.1	....
Mobil Oil Canada Ltd.—											
Bluesky, Bluesky field, 6-6-109-6w6.....	7.0	3.9	¹³ 3-5	....	....	....	....	....	....	....	....
*Carson Creek, 4 23-61-12 w5m.....	70.0	60.6	¹⁹ 20-2-4	....	54.5	....	34.7	....	....	48.1	....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
*Duhamel, 3 32-46-21 w4m	3.7	0.8	7 ²					2.3		0.9	
Harmattan East, 9-27-31-4w4	504.0	282.8	7-19 ²		91.5		69.4			148.9	
Liege, 1-16-92-21 w4m	30.0	15.0	35-1-4								
Lone Pine Creek South, 6-27-29-28 w4m	35.0	12.1	7 ²							7.7	
Pembina (Station 4), 16-49-8w5	10.4	7.7	3								
Rainbow Battery No. 10, 10-110-6w6	33.0	23.8	13 ⁵ -3						143.6		
Teepee Creek, Grande Prairie, LSD 7-2-74-4 w6m	18.5	6.0	7 ²							1.7	
Three Hills, 4 33-31-23 w4m	30.0	16.4	3-4					13.1		4.5	
Wilkeson Green, 8 29-40-6-5 w5m	2.0	1.7	3-4					2.1			
Wimbome, 4 12-34-26 w4h	30.0	20.6	3-4								
Wintering Hills, 16 7-24-16 w4h	6.0	0.8	3-4							<0.1	
Mohawk Oil Co. Ltd.—Magrath, Blood-Magrath, 7-8-6-22 w4m	8.0	7.6	3-4						0.7		
Murphy Oil Co. Ltd.—Glendon, Sugden-Grand Rapids, 03-16-61-8 w4m	11.0	0.8	4								
Princess No. 1, 14-23-19-10 w4m	7.5	4.0	13 ⁴								
Princess No. 2, 08-16-20-10 w4m	7.5	4.0	13 ⁴								
Norcan Energy Resources Ltd.—Bigoray, Parkland 31, 10-22-51-8 w5m	3.0	1.3	3-4						15.7		
Boyer, 1-17-105 1 w6m	18.0	13.0	4-8 ⁵						137.1		
Bruce, Beaver 9, 2-6-47-15 w4m	30.0	5.5	13-1-4								
Ferris, Radial Lake, se 1/4 2-34-40-9 w5m	20.6	6.8	3						238.0		
Gilby, Lacombe, 10-9-41-1 w5m	2.6	1.3	13 ² -4								
Judy Creek, 12-19-64-1 w5m	2.0	1.0	1-8 ⁵							340.0	
Kessler, 14-5-39-8 w4m	5.6	1.7	3-4								
McLeod, 16-17-55 14 w5m	3.2	2.0	3-4						35.0		
McLeod River, Dist. 14, 7-34-54-14 w5m	5.2	3.3	3-4						96.0		
Minnehik-Buck Lake, 10-5-46-6 w5m	108.0	70.0	7 ¹						43.4	32.6	
Mirage, 10-2-79-8 w4m	1.5	0.2	3-4							0.2	
Netook-Olds, Mountain View 17, 16-21-33-1 w5m	1.9	1.6	13-1-4								
Provost-Bodo, Provost 52, ne 1/4 16-31-37-2 w4m	5.0	1.0	13-1-3-4							100.0	
Spirit River, 8-34-77 6 w6m	4.0	3.1	3						6.7		
North Canadian Oils Ltd.—Atlee Buffalo, 5-22-20-4 w4m	4.0	3.5	4								
Bantry, 5-8-19-13 w4m	18.0	12.0	4								
Beaverhill Lake, 4-17-52-18 w4m	3.0	2.8	1-4								
Bellshill Lake, 7-21-42-12 w4m	4.0	3.5	1-4								
Buffalo South, 4-22-20-5 w4m	4.0	3.5	4								
Canard, 9-30-57-8 w4m	12.0	12.0	4								
Conlac, Medicine Hat, 14-14-14-3 w4m	25.0	12.0	4								
Corbett Creek, 13-26-61-8 w5m	12.0	0.5	3-4								
Delia, 1-13-32-19 w4m	25.0	23.0	4								
Dinant, Bruce, 1-26-45-19 w4m	20.0	20.0	4								
Fenn Big Valley, 8-27-35-19 w4m	8.0	7.0	3-4				3.0				
Garden-Plains, 5-15-33-13 w4m	10.0	3.5	1-4								
Hilda, Medicine Hat, 9-34-18-2 w4m	7.0	3.5	4								
Hilda Schuler, 13-9-17-1 w4m	5.0	3.4	4								
Hilda West, 4-19-18-1 w4m	3.5	2.7	4								
Jarrow, 8-15-45-11 w4m	4.0	3.5	4								
Knopcik, 9-10-74-11 w6m	25.0	20.0	3-4						7.0		
Minburn, 8-24-51-10 w4m	7.0	7.0	4								
Morinville, 11-15-55-25 w4m	2.5	1.4	1-4								
North Mannville, 13-16-53-10 w4m	7.0	6.0	4								
North Plain Lake, 13-31-54-11 w4m	14.0	14.0	4								
Schuler, 1-28-16-1 w4m	3.5	2.5	4								
Sedgewick, 4-27-44-10 w4m	3.0	1.5	4								
Simionette, 7-6-63-26 w5m	2.0	1.0	4								
Sugden, 11-11-65-9 w4m	2.0	2.0	4								
Vale, Medicine Hat, 15-19-14-3 w4m	30.0	15.0	4								
Viking-Kinsella, 11-17-46-8 w4m	15.0	10.0	4								
Warwick, 8-34-52-14 w4m	4.0	1.5	4								
West Basset Lake, 7-14-108-7 w6m	6.0	0.5	3-4						1.5		
Westlock, 13-24-61-26 w4m	9.0	6.5	3-4								
Willingdon, 11-20-55-15 w4m	18.0	10.0	4								
NW Resources Ltd.—Rainbow Lake/Black, 12-24-110-8 w6	18.0	18.0	20 ²					8.4			110.0
NSM Resources Ltd.—Choice, 5 27-40-10 w4m	3.0	3.0	3 ²							<0.1	
Oakwood Petroleum Ltd.—Atim, 10-19-54-26 w4m	2.5	2.1	4								11<0.1
Grand Forks, 8-7-12-13 w4m	2.3	1.0	7 ² -4								11<0.1
Matziwin, 6-10-23-14 w4m	8.5	3.5	4								
Simionette, 9-6-63-25 w5m	8.0	6.2	4-8								11<0.1
Palmer Ranch (1984) Ltd.—Pincher Creek, s 1/2 23-4-29 w4m	12.0	6.0	3-4	1.0						4.5	
Paloma Petroleum Ltd.—Berry, 16-21-28-13 w4m	8.0	5.0	1-3-4								110.1
Compeer, 4-31-23 1 w4m	12.0	8.0	1-2-4								
Hotchkiss, LSD 7 13-94-3 w6m	6.0	3.5	1-4								
Nestou, 11-23-60-24 w4m	4.5	1.0	1-4								
Vegreville Lavory, 6-13-52-14 w4m	8.0	4.5	1-4								
Viking, 12-36-49-13 w4m	5.0	2.5	1-4								
PanCanadian Petroleum Ltd.—Alderson West, 10-28-15-15 w4m	23.5	3.1	3							29	11<0.1
Alderson West, 6-2-16-15 w4m	6.0	1.9	3 ¹								
Bassano Latham, 10-5-22-18 w4m	25.0	5.1	3 ¹ 5								110.7
Carseland, 16-21-22-25 w4m	12.0	7.6	3								11<0.1
Countess 10-20-18-15 w4m	8.0	3.4	7 ²					3.4			112.5
Countess Makepeace, 12-33-22-18 w4m	30.0	9.5	3								112.0
Entice, 10-7-28-23 w4m	7.0	1.6	3								11<0.1
Ferrybank, 2-1-44-28 w4m	26.0	8.4	3								14.5

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Gilby Cantex Norton, 6-21-40-2 w5m	2.1	0.8	3								¹¹ 0.4
Halkirk, 03-36-37-17 w4m	3.0	0.9	3							3.7	
Hussar Crowfoot, 14-1-24-22 w4m	28.0	6.8	3					1.7			¹¹ 2.1
Long Coulee, 6-30-15-21 w4m	8.2	3.5	⁷²								¹¹ 0.8
Redland, 1-20-28-21 w4m	20.0	9.0	3		1.0			1.5			¹¹ 2.8
Rycroft, 8-25-77-06 w6m	4.0	1.2	⁷²							2.1	
Tide Lake, 16-10-18-10 w4m	10.0	6.9	3								¹¹ 0.6
Wayne Dalum, 5-17-27-19 w4m	19.0	3.4	³¹⁵								¹¹ 0.6
Wintering Hills, 1-18-25-17 w4m	20.0	2.3	3								¹¹ 0.8
Pembina Resources Ltd.—											
Breton, LSD 9-36-47-4 w5m	3.5	1.5	3					2.2			
Compeer, 6-36-33-2 w4m	5.0	1.8	²⁸¹								
Diamond Valley, 10-12-19-2 w5m	20.0	17.3	7	40.9	28.0		16.7			15.9	
Hotchkiss, North, LSD 3 35-94-2 w6m	16.0	7.7	³⁴¹								
Petro-Canada Inc.—											
Bellshill, Lake 3 28-41-12 w4m	4.2	2.2	⁷²					4.4			
*BrazEAU River, 4-31-48-12 w5m	62.5	36.2	⁷²	0.1				81.6		285.5	
*BrazEAU River, sw 1/4 31-48-12 w5m	37.3	33.7	3					43.5			
Connorsville, 9 32-25-15 w4m	20.0	8.8	3-4							2.1	
Empress, ne 11-20-01-4	2,000.0	1,872.0	6	1,369.3	622.4	96.4	123.8			100.6	
Fernier, 9 22-39-8 w5m	9.0	4.1	3-4						7.4		
Gilby No. 1064, Fina, 7 27-40-3 w5m	4.2	0.5	6							0.1	
Gilby No. 1130, 2 27-40-3 w5m	25.0	10.6	⁷²					5.6		0.1	
Gilby No. 1156, Medicine River,											
5-5-40-3 w5m	28.0	13.4	⁷²					15.7		4.1	
Gold Creek, nw 1/4 26-67-5 w6m	23.0	8.6	^{72, 4}							20.8	
Greencourt, 9 26-59-9 w5m	32.0	11.7	^{71-4, 315}							3.3	
*Kaybob North, 8 9-64-19 w5m	99.0	84.4	^{71-3, 4}						74.1	18.5	
Rainbow, 15 7-108-6 w6m	13.0	4.1	^{3, 4}							0.2	
Sedgewick, 2 16-42-12 w4m	6.0	0.7	²¹²								
Valhalla Halfway, se 1/4 12-75-9 w6m	2.8	1.2	^{131-3, 4}						3.0		
Whitecourt, 12-26-59-11 w5m	65.0	33.8	¹⁻⁴							8.5	
Wildcat Hills, 6 16-26-5 w5m	125.0	47.3	^{211-4, 315}							12.1	
Phillips Petroleum Resources Ltd.—Gilby,											
LSD 6-36-40-3 w5m	2.7	1.5	6							0.7	
Sylvan Lake, 13-25-37-2 w5m	29.8	18.5	3						24.2	<0.1	
Placer Cogo Petroleum Ltd.—											
Atlee, 09-13-21-01 w4m	2.5	1.0	4								
Bindloss, South, 11-20-23-03 w4m	17.5	14.0	1-4								
Bindloss, North, 11-27-23-04 w4m	17.3	14.0	1-4								
Hilda, 13-22-17-03 w4m	15.0	8.0	4								
Medicine Lodge, 9-9-52-21 w5m	14.5	12.0	³⁵¹								
Provoist, 4-16-33-07 w4m	5.0	1.5	²⁶²⁻⁴							¹¹ 0.1	
Sedalia, 9-29-31-05 w4m	10.0	6.8	^{4, 325}							¹¹ 0.1	
Steveville, 2-31-22-11 w4m	20.0	4.0	³²⁵							¹¹ 0.2	
Wood River, 16-08-45 23 w4m	5.0	2.0	^{1-4, 325}							¹¹ 0.2	
Saratoga Processing Co. Ltd.—Coleman,											
11-8-5 w5m	35.0	24.0	²¹¹								
Sceptre Resources Ltd.—											
Cessford, 7-17-26-14 w4m	3.5	1.0	2-4								¹¹ <0.1
Gilby, 2-35-40-2 w5m	7.5	5.7	4-8								¹¹ 1.3
Holmberg, nw 1/4 13 14-44-17 w4m	10.5	10.5	3-4-8								¹¹ 0.2
Judy Creek, 6-7-63-10 w5m	5.0	0.3	2-4								
Seiu Lake, 14-12-26-19 w4m	35.5	29.0	3-4		0.4		0.3			¹¹ 0.3	
Sorenson, 16-09-32-12 w4m	10.0	10.0	2-4					0.1		¹¹ 0.1	
Stammore, 5-1-29-12 w4m	14.0	8.5	2-4							¹¹ <0.1	
Shell Canada Ltd.—											
Bonanza, 8-80-12 w6m	4.7	4.5	¹³¹⁻⁶							3.4	
Burnt Timber 1 and 2, 13-30-7 w5m	127.0	91.8	³³¹⁻³							7.0	
Cranberry Lower Debolt, 4-20-96-3 w6m	14.0	12.8	²⁹¹⁻⁴								
Cranberry Slave Point, 4-20-96-3 w6m	17.0	10.6	³⁻⁴								
Gordondale, 24-79-11 w5m	9.3	2.8	¹³¹⁻⁶							3.7	
*Hamburg, 12-29-96-11 w6m	56.5	56.5	³¹⁵							8.4	
Hope Creek, 17-64-13 w5m	5.4	3.5	²⁹¹⁻³							5.3	
House Mountain, 8-70-10 w5m	9.2	2.7	²⁹¹⁻³						25.0		
Jumping Pound, nw 1/4 13-25-5 w5m, se 1/4 23-25-5 w5m, sw 1/4 24-25-5 w5m	200.0	158.0	^{291-2, 7}	112.5	38.5		33.8			102.9	
Pouce Coupe, 8-80-12 w6m	3.3	0.8	¹¹¹⁻⁶							1.1	
Progress, 1-78-10 w6m	45.0	36.7	¹³²⁻⁴					26.4		29.0	
Simonetie, 6-63-25 w5m	21.7	16.3	²⁹¹⁻³					15.8		9.2	
South Rosevear, ne 11-54-15 w5m	50.0	21.1	²⁹¹⁻³							6.8	
Waterton 1-2 and Straddle s 1/2 20-4-30 w4m, n 1/2 17-4-30 w4m, se 1/4 24-4-1 w5m	315.0	151.8	^{291-3, 7}	199.0	85.9		71.7			200.8	
Star Oil & Gas Ltd.—											
Grassland, 6-13-68-18 w4m	2.0	1.0	4								
Pouce Coupe, 11-34-79-12 w6m	10.0	6.0	3					4.0			
Redwater, 8-25-57-23 w4m	6.2	3.0	2-4								
Sunnybrook, Bell River Pool 15-22-48-2 w5m	5.0	2.5	3-4						0.5		
Sylvan Lake, Basal Quartz, Glauco., 16-19-38-1 w5m	8.0	6.0	^{131-3, 4}					5.9			
Steen Resources Ltd.—Crossfield, 8-20-30-3 w5m	4.0	3.0	4								¹¹ 4.2
Suncor Inc.—											
Joffre, LSD 13-12-38-12 w4m	6.4	3.4	3						5.0		
Pine Creek, 10-23-57-19 w5m	13.5	10.4	3						23.2		
Rosevear, ne 1/4 16-33-54-15 w5m	30.0	17.4	^{71, 85}							¹¹ 5.7	
Thorsby, 4-27-49-1 w5m	14.5	8.3	3						8.0		
Texaco-Canada Resources—											
Wabasca, 16-36-80-25 w4m	6.0	4.2	4								
Total Petroleum Canada Ltd.—											
Gilby, 10 12-41-3 w5m	8.0	6.0	^{71-4, 325}							¹¹ 0.9	
Hythe, 16-21-73-10 w6m	8.5	8.0	³⁻⁴					5.5		¹¹ 3.9	
Sutton 7 21-90-4 w6m	3.0	1.3	¹³¹⁻⁴								
Ulster Petroleum Ltd.—											
Huxley, 7-17-35-24 w4m	3.0	1.5	4								

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Irvine, Medicine Hat, 1-23-12-2 w4m.....	3.5	1.0	4	.....	.....	.....	.....	.....	2.6	.....	.....
Rumsey, 8-12-34-21 w4m.....	5.0	4.0	3-4	.....	.....	.....	.....	.....	.....	.....	.....
Wainwright East GGS, 11-34-44-6 w4m.....	4.0	1.5	4	.....	.....	.....	.....	.....	.....	.....	.....
Union Pacific Resources Inc.—											
Baptiste Lake, 14-34-65-24 w4m.....	22.0	6.0	7 ¹	.....	.....	.....	.....	.....	.....	.....	.....
Cynthia Pembina, 9-16-51-11 w5m.....	1.2	1.0	3	.....	.....	.....	.....	.....	1.8	.....	.....
Westcoast Energy Inc.—Ferrier											
Cardium 2, LSD 1-20-39-7 w5m.....	23.0	8.2	4	.....	.....	.....	.....	.....	.....	.....	.....
Westridge Petroleum Corp.—											
Prevo-Cygnat, LSD 5, 1-39-1 w5m.....	30.2	27.5	3-4	.....	.....	.....	.....	.....	41.8	.....	.....
Total.....	23,462.0	14,668.5		6,499.2	3,263.2	1,043.6	704.8	1,606.2	4,034.3	3,939.6	541.7

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). §And condensate. †C₃+

British Columbia

Amoco Canada Petroleum Co. Ltd.—

Alice, 8-34-83-15 w6m.....	15.9	5.5	1-6	.....	.....	.....	.....	.....	.....	.....	.....
Buick Creek North, 6-31 e-94 A-14.....	8.0	0.2	4	.....	.....	.....	.....	.....	.....	.....	.....
Dahl, a-89 H-94 H-7.....	8.0	2.6	4	.....	.....	.....	.....	.....	.....	.....	.....
Laprise, a-40 e-94 H-5.....	20.0	12.9	4	.....	.....	.....	.....	.....	.....	.....	.....
Velma, a-89 D-94 H-8.....	14.0	6.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Eso Resources Canada Ltd.—Boundary Lake,											
1-2-85-14 w6.....	17.5	1.9	2	.....	.....	.....	.....	.....	.....	.....	.....
Mobil Oil Canada Ltd.—Sierra,											
c-91-D 94-1-14.....	310.0	225.2	325-3	.....	.....	.....	.....	.....	.....	.....	.....
Norcan Energy Resources Ltd.—											
*Jedney, A-62-E/94-G-8.....	12.0	8.0	4-315	.....	.....	.....	.....	.....	.....	.....	.....
Placer CEGO Petroleum—											
Boundary Lake, 11-24-84-15 w6m.....	21.0	20.0	6	.....	.....	.....	.....	3.5	.....	.....	.....
Westcoast Energy Inc.—											
Aitken Creek, lot 3964, Peace River.....	78.0	20.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Boundary Lake, A-10-25 15 w6m.....	8.9	1.4	21	.....	.....	.....	.....	.....	.....	.....	.....
Fort Nelson, Lot 2683, Peace River.....	750.0	374.0	2858-121	.....	.....	.....	.....	.....	.....	.....	.....
McMahon Plant, 3-25+26-82-18 w6w Peace											
River.....	550.0	396.0	211	.....	.....	.....	.....	.....	.....	.....	.....
Pine River, Lot 1156, Peace River.....	140.0	58.0	291	.....	.....	.....	.....	.....	.....	.....	.....
Sikanni, Lot 3472, Peace River.....	70.0	64.0	21	.....	.....	.....	.....	.....	.....	.....	.....
Taylor, 2 36-82-18 w4m Peace River Dist.,											
Plan 7891.....	385.0	NR	7	.....	149.1	.....	59.1	.....	.....	22.2	.....
Total.....	2,408.3	1,195.7		.....	149.1	.....	59.1	3.5	.....	22.2	.....

*Ucarsol

Northwest Territories

Amoco Canada Petroleum Co. Inc.—

Pointed Mountain, 95-85-n24.....	188.0	15.8	131-4	.....	.....	.....	.....	.....	.....	.....	.....
Eso Resources Canada Ltd.—Norman Wells	31.9	12.5	5	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	219.9	28.3		.....	.....	.....	.....	.....	.....	.....	.....

Saskatchewan

Amoco Canada Petroleum Co. Ltd.—

Steelman, w/2-21-4-5 w2m.....	18.5	13.9	71-3-4 295-7	.....	.....	.....	.....	.....	104.2	.....	.....
D.M. Wolcott & Associates Ltd.—											
Nottingham, 17-5-32 w1.....	7.0	6.0	3	.....	11.9	.....	6.6	.....	.....	4.0	.....
Husky Oil Operations Ltd.—											
Hillmond, 35-51-26 w3m.....	7.5	6.2	351-4	.....	.....	.....	.....	.....	.....	.....	.....
Mackin, 7-18-37-28 w3m.....	2.0	1.5	351-4	.....	.....	.....	.....	.....	.....	.....	.....
Tangleflats, 25-50-25 w3m.....	7.4	4.6	351-4	.....	.....	.....	.....	.....	.....	.....	.....
ICG Resources Ltd.—											
Hutton, 4-15-14-27 w3m.....	9.0	8.0	3-4	.....	.....	.....	.....	.....	.....	.....	.....
Totnes, 15-33-027-18 w3m.....	2.5	1.5	4	.....	.....	.....	.....	.....	.....	.....	.....
Mobil Oil Canada Ltd.—Gull Lake,											
5-9-14-19 w3h.....	1.9	1.1	325-3	.....	.....	.....	.....	.....	.....	0.4	.....
North Canadian Oils Ltd.—											
Enterprise, 11-15-28 w3m.....	25.0	18.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Golden Prairie, 11-36-14-29 w3m.....	12.0	11.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Hutton, 6-28-14-29 w3m.....	22.0	20.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Hutton East, 4-21-14-28 w3m.....	15.0	13.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Horsham, 16-16-29 w3m.....	7.5	6.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Inglebrook, 13-6-28-23 w3m.....	3.0	3.0	9-4	.....	.....	.....	.....	.....	.....	.....	.....
McLaren Lake, 35-15-29 w3m.....	1.5	1.5	4	.....	.....	.....	.....	.....	.....	.....	.....
Richmond, Hutton, 1-4-16-29 w3m.....	20.0	18.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Sandhills, 34-13-25 w3m.....	15.0	13.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Prior Resources—Greenan, 11-12-16-16 w3m	2.0	1.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Sask Energy Corp., TransGas Div.—											
Coleville, nw 17-31-23 w3m.....	40.0	34.0	1-2	.....	.....	.....	.....	12.9	.....	.....	115.5
Hoosier, se 16-30-28 w3m.....	3.0	1.0	315	.....	.....	.....	.....	.....	.....	.....	112.5
Success, 17-16-17 w3m.....	50.0	.....	315	.....	.....	.....	.....	.....	.....	.....	.....
Saskatchewan Oil & Gas Corp.—											
Battle Creek, 13-33-4-27 w3m.....	4.2	1.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Hottoneast non-Unit, 14-2-13-28 w3m.....	24.0	24.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Hottoneast Unit, 14-2-13-28 w3m.....	3.0	1.8	4	.....	.....	.....	.....	.....	.....	.....	.....
Horsham 16-33, 16-33-17-29 w3m.....	9.2	8.5	4	.....	.....	.....	.....	.....	.....	.....	.....
Senate 9-9, 9-9-3-28 w3m.....	14.3	14.3	4	.....	.....	.....	.....	.....	.....	.....	.....
Star Oil & Gas Ltd.—Bigstick,											
5-11-14-26 w3m.....	10.0	.....	4	.....	.....	.....	.....	.....	.....	.....	.....
Hutton 3, LSD 4—4-15-14-27 w3m.....	8.0	8.0	4	.....	.....	.....	.....	.....	.....	.....	.....
Hutton East, 16-19-13-26 w3m.....	9.6	9.6	4	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	354.1	249.5		.....	11.9	.....	6.6	12.9	104.2	4.4	18.0

Company, plant, location	MMcfd		Process/ condition method	Production 1,000 gpd (Average based on the past 12 months)							Other
	Gas capacity	Gas through- put		Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gasol.	
CHILE											
Empresa Nacional del Petroleo—"Cullen, Magallanes, Primavera	150.0	113.0	191	.....	52.0	.....	37.0	.....	.....	27.0	.....
Posesión—"Cabo Negro, Magallanes, San Gregorio	320.0	310.0	7	.....	138.0	.....	83.0	.....	.....	79.0	.....
Total	470.0	423.0	.....	190.0	.....	120.0	.....	.....	106.0	.....	
CHINA, TAIWAN											
Chinese Petroleum Corp.—Chingsachu plant and field, Hsin Chu area	60.0	20.0	7	.....	.....	.....	.....	.....	7.0	.....	.....
Chinshui plant, field, Miaoli area	36.0	16.2	242	.....	5.8	.....	5.5	.....	.....	3.1	.....
Chuhuangkeng plant, field, Miaoli area	75.0	34.3	141	.....	.....	.....	.....	.....	.....	.....	.....
Tungshiao plant, Tieh-Che-Shan field, Miaoli area	100.0	39.7	7	9.4	16.2	.....	10.3	.....	.....	8.3	.....
Total	271.0	110.2	.....	9.4	22.0	.....	15.8	.....	7.0	11.4	.....
COLOMBIA											
Empresa Colombiana de Petroleos—											
Apiay, Meta	18.4	8.3	3	.....	.....	.....	.....	.....	.....	.....	.....
Barrancabermeja, Santander	100.0	82.0	7	110.0	.....	.....	29.0	.....	.....	.....	.....
Cicuco, Bolivar	40.0	9.0	3	.....	.....	.....	3.1	.....	.....	3.0	.....
El Difícil, Magdalena	25.0	10.0	1	.....	.....	.....	4.2	.....	.....	4.3	0.2 0.8
La Cira, El Centro, Santander	48.0	23.0	162	.....	17.3	.....	15.9	.....	.....	24.1	.....
Tibu, Norte Santander	62.0	7.0	3	.....	.....	.....	10.0	.....	.....	5.3	.....
Esso Colombiana Ltd.— Provincia, Santander	73.0	73.0	361-262	.....	34.0	.....	39.0	.....	.....	27.0	.....
Total	366.4	212.3	.....	110.0	51.3	.....	54.9	46.3	.....	63.7	1.0
DENMARK											
Dansk Naturgas A/S—Nybro, Ribe Amt Jutland	450.0	240.0	33-35 1-3-6	.....	.....	.....	.....	.....	.....	.....	1100.0
DUBAI											
ARCO Oil & Gas Co.—Marghan	330.0	330.0	6	.....	.....	.....	.....	.....	.....	.....	1650.5
ECUADOR											
CEPE—Ancon, Santa Elena field, Guayas	16.0	5.5	11	.....	.....	.....	1.1	.....	.....	5.6	.....
Shushufindi, Napo Province	25.0	15.0	3	.....	.....	.....	96.0	.....	.....	31.7	.....
Total	41.0	20.5	.....	.....	.....	.....	97.1	.....	.....	37.3	.....
EGYPT											
Gulf of Suez Petroleum Co.—Abu Gharadig/ Dahshour, Abu Gharadig field, Western Desert, Block 30	135.0	110.0	7-8	.....	.....	.....	122.6	.....	.....	.....	1158.8
Egyptian General Petroleum Corp.— Abu Gharadig field, 286 km west of Cairo, Western Desert	132.0	124.0	23-5-7	.....	.....	.....	.....	.....	.....	.....	11210.0
Abu Madi LTS plant and field, K. Sheikh	242.0	236.0	351-6	.....	.....	.....	.....	.....	.....	.....	11203.3
Abu Madi LPG plant and field, K. Sheikh	236.0	225.0	23-5-7	.....	.....	.....	60.4	.....	.....	.....	11215.0
Abu Qir plant and field offshore, 60 km east of Alexandria	206.0	198.0	23-5-7	.....	.....	.....	48.8	.....	.....	.....	11206.2
Dahshour, Abu Gharadig field, 65 km west of Cairo, Giza	124.0	118.0	7	.....	.....	.....	132.0	.....	.....	.....	.....
Ras-Shukelf	170.0	170.0	7	.....	.....	.....	287.2	.....	.....	.....	11173.7
Zeit Bay	78.0	55.0	351-3	.....	.....	.....	64.0	.....	.....	.....	1148.4
Total	1,323.0	1,236.0	.....	.....	.....	.....	715.0	.....	.....	1,215.4	.....
FRANCE											
SNEA—Usine de Lacq	570.0	563.0	1	.....	139.0	.....	132.0	.....	.....	270.0	.....
GERMANY											
Mobil Oil AG— Norddeutsche Erdgas Aufbereitungs GmbH, Schölen Concession, Lower Saxony, Sulingen Province (50% MoAG)	307.0	223.0	27-29-331	.....	.....	.....	.....	.....	.....	.....	.....
Wintershall AG— Emilshheim, Emaland, Lower Saxony	27.0	17.0	11	(sulfur recovery only)	.....	.....	.....	.....	.....	.....	.....
Ruetenbrock, Emaland, Lower Saxony	32.0	34.0	29-201	(sulfur recovery only)	.....	.....	.....	.....	.....	.....	.....
Total	366.0	274.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
GREECE											
North Aegean Petroleum Co.—Gas sweetening plant, Prinos and South Kavala field	27.0	17.3	91	.....	.....	.....	.....	.....	72.0	.....	.....
NGL plant, Prinos and South Kavala field	13.0	12.4	3	.....	.....	.....	.....	.....	38.3	.....	.....
Total	40.0	29.7	.....	.....	.....	.....	.....	.....	110.3	.....	.....
HUNGARY											
OKGT: Babócsa plant and field, Somogy	24.7	NR	6	.....	.....	.....	.....	.....	.....	.....	112.8
Berekfürdő, Tatarúls-Kunmadaras, Szolnok	28.3	5.2	6	.....	.....	.....	.....	.....	.....	.....	.....
*Demjén plant and field, Heves	5.1	1.8	5	.....	.....	.....	.....	.....	.....	.....	110.2

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Ebes plant and field, Hajdu-Bihar	8.5	3.0	6	.....	.....	.....	.....	.....	.....	.....	¹¹ 0.3
Endröd plant and field, Bekes	70.0	38.6	6	.....	.....	.....	.....	.....	46.6	.....	.....
Hajduszoboszi plant and field, Hajdu-Bihar	77.7	25.0	¹²	.....	.....	.....	1.2	.....	.....	30.2	.....
Kardoskut plant, Pusztaföldvár field, Békés	42.4	28.5	3	.....	.....	.....	.....	.....	.....	35.1	.....
Kiskunhalas plant and field, Bács-Kiskun	8.5	0.9	6	.....	.....	.....	.....	.....	.....	.....	¹¹ 0.5
Szank plant and field, Bács-Kiskun	77.7	52.9	3	.....	.....	.....	.....	.....	.....	.....	¹¹ 1.9
Szeged plant, Algyó field, Csongrád	566.0	245.0	¹² 3-6	.....	65.7	6.3	68.8	.....	179.2	753.9	¹⁴ 0.6
Tázlár plant and field, Bács-Kiskun	28.3	3.9	6	.....	.....	.....	.....	.....	.....	.....	¹¹ 3.3
Üllés plant and field, Csongrád	160.0	70.5	6	.....	.....	.....	.....	.....	141.6	.....	.....
Total	1,097.2	475.3		.....	65.7	6.3	70.0	.....	367.4	819.2	103.6

INDONESIA

Atlantic Richfield Indonesia Inc.—Ardjuna, mw Java Sea, 90 miles ne of Jakarta	180.0	60.0	7	.....	201.6	113.4	.....	.....	.....	.....	.....
Mobil Oil Indonesia Inc., *Arun field	1,000.0	1,000.0	7	.....	.....	.....	.....	.....	1,200.0	.....	.....
NGL, Aceh Province, B Block PSC	2,270.0	2,064.0	6-7	17.3	1.4	.....	0.9	.....	.....	.....	¹¹ 5.2
Pertamina Arun Natural Gas Liquefaction Co.—*Pertamina Arun, Aceh Utara, Aceh	15.0	12.0	6	.....	.....	.....	.....	.....	.....	.....	¹¹ 19.0
Petromer Trend Corp.—Arar, Arar-Kialin field, Irian Jaya Province, Kepala Burung	2.0	1.2	6	.....	.....	.....	.....	.....	.....	.....	¹¹ 8.4
Walio, Irian Jaya Province, Kepala Burung	35.0	23.5	3	.....	.....	.....	33.0	16.2	.....	.....	.....
Petromina—Mundu, Jatibarang, West Java	28.0	17.5	1	.....	.....	.....	18.6	.....	.....	.....	.....
Rantau, North Sumatra	200.0	160.0	¹²⁻¹³	.....	.....	.....	.....	.....	45.0	.....	.....
Total Indonesia—Handil CPA, East Kalimantan	25.0	20.0	¹³	.....	.....	.....	.....	.....	16.0	.....	.....
Senipah Terminal, East Kalimantan	150.0	140.0	7	.....	126.0	.....	.....	.....	.....	.....	.....
Unocal Indonesia Ltd.—Santan LEX, Attaka, East Kalimantan	3,905.0	3,498.2		17.3	329.0	113.4	0.9	51.6	1,277.2	.....	32.6
Total	3,905.0	3,498.2		17.3	329.0	113.4	0.9	51.6	1,277.2	.....	32.6

ITALY

AGIP SPA—Brugherio, Po Valley	300.0	13.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Casalborsetti, Porto Garibaldi field, Bologna, Emilia-Romagna, Po Valley	796.0	367.0	1	.....	.....	.....	.....	.....	.....	0.1	.....
Casirate d'Adda, Malossa field, Bergamo, Lombardia, Po Valley	53.0	10.0	2	.....	.....	.....	.....	2.7	8.0	.....	.....
Cortemaggiore, Piacenza, Po Valley	106.0	28.0	1	.....	.....	.....	.....	.....	.....	0.1	.....
Crotone, Luna field, Catanzaro, Calabria	265.0	141.0	1	.....	.....	.....	.....	.....	.....	<0.1	.....
Falconara, Barbara 'A' field, Ancona	177.0	112.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Fano, Basil, Pesaro	177.0	27.0	1	.....	.....	.....	.....	.....	.....	.....	.....
*Gagliano, Enna, Sicily	142.0	11.0	5	.....	.....	.....	.....	.....	.....	6.5	.....
Grottammare, Emilio-David field, Ascoli Piceno	115.0	51.0	1-2	.....	.....	.....	.....	.....	.....	<0.1	.....
Hera Lacinia, Crotone, Catanzaro	88.0	22.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Minerbio, Bologna, Po Valley	1,910.0	125.0	1	.....	.....	.....	.....	.....	.....	<0.1	.....
Pineto, Fratello-Squalo-Emma field, Roseto, Pescara	177.0	86.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Ravenna Mare, Porto Corsini Est-Angela fields, Bologna, Emilia Romagna, Po Valley	354.0	242.0	1	.....	.....	.....	.....	.....	.....	0.3	.....
Ripalta, Cremona, Po Valley	354.0	77.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Rubicone, Cervia and Cesenatico fields, Bologna, Emilia-Romagna, Po Valley	265.0	147.0	1	.....	.....	.....	.....	.....	.....	0.2	.....
Sernano, Cremona, Po Valley	1,981.0	51.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Settala, Po Valley	354.0	77.0	1	.....	.....	.....	.....	.....	.....	.....	.....
Total	7,614.0	1,567.0		.....	.....	.....	.....	2.7	8.0	7.5	.....

KUWAIT

Kuwait National Petroleum Co.—											
Mina Al-Ahmadi-1 .....	↑	↑	↑	.....	(290.8)	(348.3)	.....	.....	.....	(320.5)	.....
Mina Al-Ahmadi-2 .....	↑	↑	↑	.....	(541.5)	(648.5)	.....	.....	.....	(596.8)	.....
*Mina Al-Ahmadi	1,815.0	1,452.0	¹⁻²⁶⁻¹³² ⁴⁻²³⁵	.....	1,722.0	.....	980.0	.....	.....	811.8	.....
Total	1,815.0	1,452.0		.....	1,722.0	.....	980.0	.....	.....	811.8	.....

†Fractionation. (Figures in parenthesis do not represent primary production, and are not included in totals).

LIBYA

Oasis Oil Co. of Libya Inc.—											
*Bahi, Concession 32	15.0	10.0	2-4	.....	.....	.....	.....	.....	.....	.....	¹¹ 160.0
*Dahra, Concession 32	140.0	20.0	2-4	.....	.....	.....	.....	.....	.....	.....	¹¹ 11.0
Defa, Concession 59 and 71	104.0	47.0	4	.....	.....	.....	.....	.....	.....	.....	¹¹ 210.0
Waha, Concession 59W	52.0	52.0	4	.....	.....	.....	.....	.....	.....	.....	¹¹ 170.0
Occidental of Libya, Inc.—											
103A, Sirte Basin, Petroleum Zone II	670.0	450.0	3	.....	.....	.....	.....	.....	666.0	.....	.....
103D, Sirte Basin, Petroleum Zone II	420.0	255.0	3	.....	.....	.....	.....	.....	375.0	.....	.....
Socialist People's Libyan Arab Jamahiriya, Marsa Brega	450.0	393.0	NR	.....	.....	.....	.....	37.8	4,536.0	.....	.....
Total	1,851.0	1,227.0		.....	.....	.....	.....	37.8	5,577.0	.....	551.0

MALAYSIA

Petronas—Dew Point Control Unit, Kerteh, Terengganu	250.0	74.0	6-7	.....	23.2	.....	28.2	.....	.....	57.0	.....
LPG Unit, Kerteh Kemaman, Terengganu	32.0	31.0	¹⁹⁻²⁶⁻²	161.4	.....	136.3	.....	.....	.....	97.1	.....
Total	282.0	105.0		161.4	23.2	136.3	28.2	.....	.....	154.1	.....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
MEXICO											
Petrleos Mexicanos—Cactus, Chiapas											
(6 plants).....	1,450.0	1,087.0	6-7	16,947.1	.....	.....	.....	.....	.....	.....	.....
Ciudad Pemex A, Tabasco.....	550.0	286.7	192	1387.4	.....	.....	.....	.....	.....	.....	.....
Ciudad Pemex C, Tabasco.....	200.0	182.0	7	1811.1	.....	.....	.....	.....	.....	.....	.....
La Venta A, Tabasco.....	200.0	162.4	192	1521.2	.....	.....	.....	.....	.....	.....	.....
La Venta C, Tabasco.....	182.0	212.0	7	1967.9	.....	.....	.....	.....	.....	.....	.....
Matapionche, Veracruz.....	50.0	108.0	3	.....	.....	.....	.....	.....	.....	.....	115.2
Nuevo Pemex, Tabasco.....	500.0	443.0	7	12,353.9	.....	.....	.....	.....	.....	.....	.....
Nuevo Pemex, Tabasco.....	500.0	374.0	7	11,987.2	.....	.....	.....	.....	.....	.....	.....
Pajaritos, Coatzacoalcas, Veracruz.....	192.0	155.0	7	1241.4	.....	.....	.....	.....	.....	.....	.....
Pozza Rica, Veracruz.....	275.0	317.0	7	1704.7	.....	.....	.....	.....	.....	.....	.....
Reynosa, Tamaulipas.....	550.0	234.0	192	1252.1	.....	.....	.....	.....	.....	.....	.....
Total	4,649.0	3,561.1		15,174.0	.....	.....	.....	.....	.....	.....	15.2
†C ₂ +											
NETHERLANDS											
Amoco Netherlands Petroleum Co.—Alkmaar, (Koedijk), Bergen, Bergenmeer, Groot, Schermer, North Holland.....											
.....	440.0	145.0	325	.....	.....	.....	.....	.....	.....	.....	116.1
NEW ZEALAND											
Natural Gas Corp. of New Zealand—											
*Kapuni, Taranaki, Lot 1, Dp 5227, Sec. 11, B-XVI, Kaipokouini SD area 11.2.27 ..	100.0	57.0	71-3	.....	39.0	.....	.....	.....	.....	9.0	.....
*Kapuni.....	152.0	37.0	3	.....	.....	.....	.....	.....	.....	.....	.....
Petrochem—											
Kapuni, Waimate West.....	100.0	50.0	14,131-3	.....	.....	.....	0.7	37.7	.....	9.6	.....
Kapuni, Waimate West.....	152.0	43.0	131-3-4	.....	.....	.....	.....	.....	.....	.....	.....
Shell BP and Todd Oil Services Ltd.—											
*Kapuni, Taranaki.....	300.0	121.0	4	.....	.....	.....	.....	.....	.....	11209.7	.....
Maui, Oaonui, Taranaki.....	640.0	318.0	11-242	.....	<0.1	.....	1.1	97.0	.....	11524.0	.....
Total	1,444.0	626.0		.....	39.1	.....	1.8	134.7	.....	18.6	733.7
NORWAY											
Amoco Norway Oil Co. Valhall A, 56° 16' 41 395" North, 3° 23' 43.193" East.....											
.....	350.0	100.0	7	.....	.....	.....	.....	.....	292.0	.....	.....
Statol—Statpipe, Tysvaer, Rogaland.....	600.0	437.0	7	.....	682.0	108.0	256.0	.....	.....	193.0	.....
Total	950.0	537.0		.....	682.0	108.0	256.0	.....	292.0	193.0	.....
OMAN											
Sultanate of Oman—Fahud.....											
Rima.....	50.0	25.0	3	.....	.....	.....	.....	.....	12.0	.....	.....
Saihi Nihayda.....	2.0	1.4	4-8	.....	.....	.....	.....	.....	.....	13.0	.....
Sayyala.....	80.0	24.0	3	.....	.....	.....	.....	.....	5.0	.....	.....
Yibal.....	14.0	7.0	4-8	.....	.....	.....	.....	.....	.....	30.0	.....
Yibal.....	80.0	72.0	3	.....	.....	.....	.....	.....	185.0	.....	.....
Yibal.....	↑	↑	↑	.....	(0.5)	.....	(6.0)	.....	.....	.....	.....
Yibal A-B-X.....	200.0	80.0	3-6	.....	.....	.....	.....	.....	.....	.....	.....
Yibal C-D.....	200.0	100.0	6-7	.....	.....	.....	.....	.....	.....	.....	.....
Total	625.0	309.4		.....	.....	.....	.....	.....	202.0	43.0	.....
†Fractionation. (Figures in parenthesis do not represent primary production, and are not included in totals).											
PAKISTAN											
Oil and Gas Development Corp.—											
Dakhni field, Punjab province.....	30.0	30.0	131	.....	.....	.....	.....	5.0	58.8	.....	.....
Loti field, Baluchistan province.....	70.0	50.0	131	.....	.....	.....	.....	.....	.....	.....	.....
Pirkoh field, Baluchistan province.....	250.0	180.0	131	.....	.....	.....	.....	.....	.....	.....	.....
Toot field, Punjab province.....	20.0	6.0	131	.....	.....	.....	.....	.....	.....	.....	.....
Pakistan Oilfields Ltd.—*Meyel gas purification plant, Attock district, Punjab province.....											
.....	40.0	17.4	211	.....	.....	.....	.....	.....	.....	.....	115.4
*Meyel LPG plant, Attock district, Punjab province.....	75.0	25.3	4-235-7	.....	.....	.....	.....	48.8	6.1	.....	3.7
Sui Northern Gas Pipeline Ltd.—											
Sui Gas Purification & Dehydration plant—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sui district dera bugti, Baluchistan.....	430.0	380.0	218361-25	.....	.....	.....	.....	.....	.....	.....	.....
Sui Southern Gas Co. Ltd.	360.0	290.0	218361-25	.....	.....	.....	.....	.....	.....	.....	.....
Total	1,275.0	978.7		.....	.....	.....	.....	53.8	64.9	.....	9.1
PERU											
Petrleos del Peru—Pariñas-Pozo,											
Piura, Talara.....	70.0	37.0	2	.....	3.4	.....	1.0	5.6	28.9	.....	4.0
Verdun, Pariñas, Piura, Talara.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	70.0	37.0		.....	3.4	.....	1.0	5.6	28.9	.....	4.0
QATAR											
Qatar General Petroleum Corp.—											
Umm Said No. 1, Dukhan field, onshore	339.0	201.0	3-215	.....	295.0	145.0	.....	.....	.....	77.0	.....
Umm Said No. 2, offshore.....	240.0	90.0	231-3-215	.....	211.0	143.0	.....	.....	.....	122.0	.....
Total	579.0	291.0		.....	506.0	288.0	.....	.....	.....	199.0	.....

Company, plant, location	MMcfd			Production 1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
SAUDI ARABIA											
Saudi Aramco†—Abqaiq	580.0	NR	3-4	.....	.....	.....	.....	.....	.....	.....	.....
Berri	600.0	NR	⁹ 1-3-4 23-5	.....	.....	.....	.....	.....	.....	.....	.....
Ras Tanura	120.0	NR	⁹ 1-3-4 23-5	.....	.....	.....	.....	.....	.....	.....	.....
Shedgum	1,500.0	NR	⁹ 1-3-4 23-5	.....	.....	.....	.....	.....	.....	.....	.....
Uthmaniyah	1,500.0	NR	⁹ 1-3-4 23-5-6	.....	.....	.....	.....	.....	.....	.....	.....
Total	4,300.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

†Design capacity. Fractionation plants located at Ju'Aymah, and Yanbu. Total LPG Plus natural gasoline produced from the seven plants = 45,850,000.0 gallons per day.

SHARJAH, U.A.E.

Amoco Sharjah Oil Co.—Condensate Sep. fac.											
Sajaa field	500.0	384.0	8	.....	.....	.....	.....	.....	.....	.....	¹¹ 974.0
Shalco LPG, Sajaa field	440.0	384.0	7	.....	287.0	.....	206.0	.....	.....	.....	¹¹ 190.0
Total	940.0	768.0	.....	.....	287.0	.....	206.0	.....	.....	.....	1,164.0

SPAIN

Repsol Exploración SA—											
*Gaviota P/F, Offshore Bermeo, Vizcaya,											
Concession I-II	186.0	84.0	³⁵ 1	.....	.....	.....	.....	.....	.....	.....	¹¹ 31.0
*Machichaco, Gaviota, Bermeo, Vizcaya	186.0	84.0	³⁵ 2	.....	.....	.....	.....	.....	.....	.....	¹¹ 42.0
*Serrablo Concession, Sabiñanigo, Huesca	56.0	9.0	³⁵ 1	.....	.....	.....	.....	.....	.....	.....	.....
Total	428.0	177.0	.....	.....	.....	.....	.....	.....	.....	.....	73.0

THAILAND

Petroleum Authority of Thailand—											
Gas separation Plant I, Rayong,											
Mabtapud District	350.0	350.0	²³ 5-146	.....	.....	.....	.....	400.4	.....	84.0	.....
Plant II, Dew Point Control, Rayong,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mabtapud District	500.0	200.0	3	.....	.....	.....	.....	.....	8.4	.....	.....
Total	850.0	550.0	.....	.....	.....	.....	.....	400.4	8.4	84.0	.....

UNITED KINGDOM

Amoco U.K.—Bacton, Leman (49/26 27,											
28&53/1-2); Indefatigable (49/18 19-23&24)											
Northwest Hutton, 211/27	1,800.0	680.0	3	.....	.....	.....	.....	.....	.....	.....	¹¹ 32.0
British Gas Plc.—Barrow Terminal,	75.0	0.0	7	.....	.....	.....	.....	.....	.....	.....	.....
Cumbria Co.	1,200.0	23.9	3	.....	.....	.....	.....	.....	.....	.....	¹¹ 4.9
Easington Terminal, Humberside Co.	1,300.0	13.3	³¹ 5-3	.....	.....	.....	.....	.....	.....	.....	¹¹ 0.4
BP Petroleum Development UK Ltd.—											
Easington and West Sole, Block 48/6,											
Southern North Sea											
.....	300.0	168.0	1-2 4-5	.....	.....	.....	.....	.....	.....	.....	¹² 11.8
Kinnell, Forties Field	70.0	48.0	4	.....	332.0	.....	291.0	.....	.....	176.0	.....
Shell UK Exploration & Production—											
Bacton, Norfolk, Southern North Sea											
.....	2,000.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mossmoran, Fife, North Sea .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Fergus, Aberdeenshire, North Sea	1,100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Oil Marine Ltd.—Saint Fergus, Frigg field,											
Grampian province											
.....	65.0	46.0	3	.....	.....	.....	.....	.....	.....	1,572.5	.....
Total	7,910.0	979.2	.....	.....	332.0	.....	291.0	.....	0.0	1,748.5	49.1

†Fractionation.

VENEZUELA

Corpoven											
Guara Oeste, Anzoategui	42.0	45.0	1	.....	.....	.....	.....	15.0	.....	11.5	.....
Jose, Oriente, Anzoategui .....	.....	.....	.....	.....	(996.0)	(264.4)	(316.7)	.....	.....	(336.8)	(17.0)
Oficina, Anzoategui	9.0	3.0	1	.....	.....	.....	.....	6.3	.....	5.0	.....
San Joaquin, Oriente, Anzoategui	800.0	870.0	7	.....	.....	.....	.....	.....	1,930.9	.....	.....
Santa Rosa, Anzoategui	300.0	250.0	2	.....	.....	.....	.....	210.0	.....	71.4	.....
Lagoven											
Tia Juana 1, Zulia	230.0	210.0	1	.....	.....	.....	.....	.....	180.2	.....	.....
Tia Juana 2, Zulia	450.0	450.0	3	.....	.....	.....	.....	.....	640.2	.....	.....
Tia Juana 3, Zulia	455.0	.....	3	.....	.....	.....	.....	.....	300.7	.....	.....
Ute fractionation plant, Punta Gorda Zulia .....	.....	.....	.....	.....	(408.2)	(68.9)	(281.8)	.....	.....	(362.0)	.....
Maraven											
Bajo Grande fractionation plant, Zulia .....	.....	.....	.....	.....	(75.6)	.....	(71.4)	.....	.....	(75.6)	.....
El Tablazo, Zulia	165.0	134.0	7	213.3	168.0	.....	88.2	.....	.....	67.2	.....
Lama Liquido, Zulia	150.0	120.0	3	.....	.....	.....	.....	.....	197.4	.....	.....
Lamar Liquido, Zulia	162.0	25.0	3	.....	.....	.....	.....	.....	25.2	.....	.....
La Paz, Zulia	150.0	70.0	1	.....	29.4	.....	25.2	.....	.....	16.8	.....
Total	2,913.0	2,557.0	.....	213.3	197.4	.....	113.4	231.3	3,274.6	171.9	.....

†Figures in parenthesis do not represent primary production, and are not added to totals. Jose plant fractionates raw NGL mix from San Joaquin and Santa Rosa plants. Ute plant fractionates all raw NGL mix from Lagoven plants. Bajo Grande plant fractionates raw NGL mix from Lama and Lamar Liquido plants.

YEMEN

Yemen Hunt Oil Co.—*Alif field,											
Marib/Al Jawf basin											
.....	400.0	433.0	¹⁰ -51 ₁	.....	.....	.....	.....	53.6	305.5	.....	.....

World sulfur derived from oil, gas production

LOU ANN THRASH
Director of Editorial Surveys

As of Jan. 1, 1991

- Metric tons/day -					- Metric tons/day -				
Company and location	Source	Type of process	Design	Production	Company and location	Source	Type of process	Design	Production
			capacity					capacity	
ABU DHABI									
Abu Dhabi National Oil Co.					Okotoks, Al.	acid gas	Mod. Claus 2 stage	370.0	260.0
Thammama C, Habshan	nat. gas	3 bed Claus	800.0	400.0	Chevron Canada Ltd.				
Ruwais	ref. gas	2 bed Claus	93.0	52.0	Burnaby, BC	ref. gas	Stretford	10.0	....
ARGENTINA									
Duperial	acid gas	Claus	44.2	0.0	Chevron Canada Resources Ltd.				
Electroclor SAIC					Kaybob, South Al.	nat. gas	Mod. Claus	3,200.0	....
Capitan Bermudez, Santa Fe	carb. disulf	Chlorination	10.6	0.0	Consumers Cooperative Refineries Ltd. Regina,—Saskatchewan	ref. gas	Mod. Claus 3 stage	270.0	200.0
AUSTRALIA									
BP Australia					Esso Resources Canada Ltd.				
Bulwer Island	ref. gas	Claus	25.0	8.0	Bonnie Glen	solution gas	Claus	35.0	6.7
Kwinana	ref. gas	Claus	35.0	30.0	Joffre	solution gas	Claus	23.5	14.8
Caltex Refining Co. Pty. Ltd.					Quirk Creek	nat. gas	Claus-MCRC	325.0	216.0
Kurnell, NSW	ref. gas	Claus	70.0	14.8	Redwater	solution gas	Claus	11.0	5.9
Petroleum Refineries Australia Pty Ltd.					Gulf Canada Corp.				
Adelaide	ref. gas	Claus	40.0	2.4	Hanlan-Robb, Al.	nat. gas	Mod. Claus Sulfreen-TG	1,100.0	653.9
Altona	ref. gas	Claus	27.0	2.5	Nevis, Al.	nat. gas	Mod. Claus Sulfreen-TG	163.0	121.3
Shell Refining (Australia)					Rimbey, Al.	nat. gas	Mod. Claus	128.0	38.8
Clyde, NSW	ref. gas	Claus-DEA	115.0	5.0	Strachan, Al.	nat. gas	Mod. Claus Cold bed adsorption	1,000.0	453.1
Geelong, Victoria	ref. gas	Claus-DEA	100.0	9.0	Husky Oil Operations Ltd.				
AUSTRIA									
OelMV AG					Nordeg River, Al.	nat. gas	Mod. Claus 2 stage	40.0	22.0
Aderklaas	sour gas	Claus	55.0	30.0	Rainbow Lake, Al.	oil and gas	Mod. Claus 2 stage	150.0	60.0
Schwechat	ref. gas	Claus	180.0	69.0	Ram River, Al.	nat. gas	Mod. Claus 2 stage Sulfreen	4,800.0	2,320.0
Schwechat	flue gas	Claus	34.0	12.0	Mobil Oil Canada Ltd.				
BAHRAIN									
Bahrain Petroleum Co. BSC (Closed)					Harmattan, Al.	nat. gas	Claus	45.0	36.0
Sitra	ref. gas	Mod. Claus	150.0	142.0	Lone Pine Creek So., Al.	nat. gas	Claus	157.0	94.0
BELGIUM									
Belgian Refining Corp.					Teepee Creek, Al.	nat. gas	Claus	30.0	16.0
Antwerp	ref. gas	Claus 3 stage	108.0	25.0	Wimbome, Al.	nat. gas	Claus	182.0	94.0
Esso Belgium					Norcen Energy Resources Ltd.				
Antwerp	ref. gas	2 Claus 1 IFP	400.0	260.0	Minnehik-Buck Lake, Al.	nat. gas	Claus 2 stage	35.0	22.0
Fina Raffinaderij Antwerpen					N.W. Resources Ltd.				
Antwerp	ref. gas	Claus	150.0	110.0	Rainbow, Al.	nat. gas	Mod. Claus	....	15.0
BRAZIL									
Petrobras					Pembina Resources Ltd.				
Refap—Canoas, RS	ref. gas	Claus	25.0	12.0	Hartell, Al.	nat. gas	Claus 3 stage	10.7	10.7
Regap—Betim, MG	ref. gas	Claus	60.0	58.0	Petro-Canada Inc.				
Repar—Araucária, PR	ref. gas	Claus	65.0	33.0	Brazeau, Al.	sour gas	3 bed MCRC	420.0	282.8
Replan—Paulinia, SP	ref. gas	Claus	60.0	38.0	Gold Creek, Al.	nat. gas	Claus 2 stage	42.7	11.2
Revap—São Jose Campos, SP	ref. gas	Claus	170.0	26.0	Wildcat Hills, Al.	sour gas	Claus 2 stage	176.8	155.2
Six—Sao Mateus do Sul, PR	ref. gas	Claus	23.0	16.0	Petrogas Processing Ltd.				
Petroflex SA					Balzac, Al.	nat. gas	Amine Claus Sulfreen	1,700.0	750.0
Duque de Caxias, RJ	ref. gas	Claus	40.0	35.0	Saratoga Processing Co. Ltd.				
Ultrafertil SA					Coleman, Al.	sour gas	Mod. Claus	400.0	278.0
Araucária, PR	resid asphalt	Claus Pool 1500	57.8	33.0	Shell Canada Ltd.				
Cubatão, SP	ref. gas	Claus	45.0	19.0	Burnt Timber, Al.	nat. gas	Claus	509.0	465.0
CANADA									
AEC Oil & Gas Co.					Jumping Pound, Al.	nat. gas	Claus	619.0	450.0
Hythe-Brainard, Al.	nat. gas	Claus	105.0	71.0	Progress, Al.	nat. gas	Claus-MCRC	15.0	15.0
Amoco Canada Petroleum Co. Ltd.—Bigstone, Al.	nat. gas	2 bed Mod. Claus	385.0	300.0	Rosevear, Al.	nat. gas	Claus	145.0	70.0
Brazeau, Al.	nat. gas	2 bed Claus	110.0	42.0	Sarnia, Ont.	ref. gas	Claus	35.0	27.0
Caroline, Al.	nat. gas	2 bed Claus	8.3	6.0	Scottford, Al.	ref. gas	Claus	10.0	10.0
Caroline (Garr), Al.	nat. gas	Recycle Selectox	10.4	....	Shellburn, Ont.	ref. gas	Claus	16.0	8.0
East Crossfield, Al.	nat. gas	2 bed Claus and CBA	1,797.0	858.0	Simonette, Al.	nat. gas	Claus	100.0	70.0
Edson, Al.	nat. gas	3 bed Claus	288.0	95.0	Waterton, Al.	nat. gas	Claus	2,500.0	2,280.0
Kaybob I-II, Al.	nat. gas	3 bed Claus & Sulfreen	1,086.0	482.0	Sulconam Inc.				
Lone Pine, Al.	nat. gas	3 bed Claus	283.0	89.0	Montreal East, Que.	ref. gas	Mod. Claus 3 stage	300.0	100.0
Steelman, Sask.	nat. gas	Mod. Claus	7.0	....	Suncor Inc.				
Sturgeon Lake, Al.	nat. gas	2 bed Claus	98.0	64.0	Ft. McMurray, Al.	oil sands	Claus 3 stage	815.0	315.0
West Pembina, Al.	nat. gas	2 bed Claus and CBA	340.0	233.0	Rosevear, Al.	nat. gas	Claus 3 stage	115.0	62.0
West Whitecourt, Al.	nat. gas	2 bed Claus	1,330.0	1,031.0	Sunoco Inc.				
Zama, Al.	nat. gas	2 bed Claus	74.0	32.0	Sarnia, Ont.	ref. gas	Claus	53.4	32.0
Canadian Occidental Petroleum Ltd.					Syncrude Canada Ltd.				
Mazeppa, Al.	acid gas	Mod. Claus 3 stage	560.0	130.0	Mildred Lake, Al.	oil sands	Mod. Claus 3 stage	530.0	320.0
						oil sands	Mod. Claus 3 stage	530.0	320.0
						oil sands	Mod. Claus 2 stage	700.0	470.0
						oil sands	Sulfreen TG	96.0	55.0

Company and location	Source	Type of process	-Metric tons/day- Design capacity	Production
Texaco Canada Resources Ltd.				
Bonnie Glen, Al.	solution gas	Mod. Claus	15.2	8.0
Westcoast Energy Inc.				
Chetwynd, BC	sour gas	MCRC	1,034.0	567.0
Fort Nelson, BC	sour gas	Mod. Claus Sulfreen	650.0	264.0
Taylor, BC	sour gas	Mod. Claus	460.0	294.0
CHINA, TAIWAN				
Chinese Petroleum Corp.				
Kaohsiung-3	ref. gas	Parsons	45.0	7.0
Kaohsiung-4	ref. gas	Amoco	117.0	11.0
Kaohsiung-5	ref. gas	Amoco	200.0	38.0
Kaohsiung-6	ref. gas	Amoco	200.0	57.0
Kaohsiung-7	ref. gas	JGC	250.0	0.0
Taoyuan-3	ref. gas	Amoco	200.0	75.0
Taoyuan-4	ref. gas	Claus	95.0	27.0
COLOMBIA				
Empresa Colombiana de Petroleos				
Barrancabermeja	ref. gas	Claus	80.0	35.0
DENMARK				
AS Dansk Shell				
Fredericia	ref. gas	Claus	25.0	3.0
Kuwait Petroleum Refining Denmark AS				
Gulthavn	ref. gas	Claus	50.0	22.0
EGYPT				
Ameria Petroleum Refining Co.				
Alexandria	HDS gases	Claus	....	3.1
General Petroleum Co.				
Ras Gharib	assoc. gas	Claus	....	8.7
Suez Oil Processing Co.				
El-Suez	ref. gas coker gas	Claus	81.5	9.1
FINLAND				
Neste Oy				
Naantali	ref. gas	Claus	55.0	26.0
Porvoo	ref. gas	Claus	215.0	116.0
FRANCE				
Cie. de Raff. et de Distillation				
Total France				
Gonfreville l'Orcher	ref. H ₂ S	Claus	190.0	70.7
La Mede	ref. H ₂ S	Claus	190.0	42.4
Mardyck	ref. H ₂ S	Claus	130.0	36.5
Cie. Rhenane de Raffinage				
Reichstett	ref. gas	Claus	55.0	10.0
Elf France				
Donges	ref. gas	Claus	210.0	70.0
Feyzin	ref. gas	Claus	118.0	39.0
Grandpuits	ref. gas	Claus	125.0	25.0
Esso SA Francaise				
Fos-sur-Mer	ref. gas	Claus	120.0	48.0
Shell Francaise				
Berre	ref. gas	Claus	210.0	25.0
Petit-Couronne	ref. gas	Claus	210.0	30.0
Ste. Francaise des Petroles BP				
Lavera	ref. gas	Claus	194.0	178.0
Ste. Francaise Hoechst				
Port Jerome	ref. gas	Claus	240.0	....
Ste. Nationale Elf Aquitaine				
Lacq	sour gas	Claus Sulfreen	....	2,022.0
GERMANY				
DEA Mineralol AG				
Heide	ref. gas	2 Claus Maxisulf	57.0	21.0
Wesseling	ref. gas	Claus	375.0	85.0
DMP Mineralol				
Burghausen	ref. gas	Claus	13.7	13.7
Deutsche Shell				
Godorf	ref. gas	Claus-Scot	140.0	60.0
Harburg	ref. gas	Claus-Scot	78.5	30.0
Erdgasaufbereitungsanlage Grossenkneten	nat. gas	....	2,100.0	1,527.0
Erdol-Raffinerie Neustadt GmbH & Co. OHG				
Neustadt-Donau	ref. gas	Claus Sulfreen	89.0	20.0
Esso				
Ingoistadt	ref. gas	Claus Sulfreen	65.0	40.0
Karlsruhe	ref. gas	Claus Sulfreen	100.0	76.0
Mobil Oil AG				
Woerth	ref. gas	....	60.0	9.3
Mobil AG-Norddeutsche Erdgas Aufbereitungs				
Sulingen	nat. gas	Claus	1,050.0	541.0
OMW GmbH				
Karlsruhe	ref. gas	Claus Sulfreen	225.0	....

Company and location	Source	Type of process	-Metric tons/day- Design capacity	Production
Raffineriengesellschaft Vohburg/Ingolstadt	ref. gas	Claus	90.0	28.0
Ruhr Oel GmbH				
Gelsenkirchen	ref. gas	Claus-Scot & Sulfreen	445.0	198.0
Wintershall AG				
Lingen	ref. gas	Claus	112.0	50.0
Ruelenbrock	nat. gas	Claus	7.4	7.1
GREECE				
Hellenic Aspropyrgos Refinery SA				
Aspropyrgos, Attiki	ref. gas	Claus & CBA	200.0	120.0
Motor Oil Hellas				
Corinth	ref. gas	Claus	90.0	38.0
North Aegean Petroleum Co.				
Sigma	Acid gas	Claus	568.0	270.0
Thessaloniki Refining Co. SA				
Thessaloniki	Acid gas	Mod. Claus	40.0	20.0
HUNGARY				
Danube Petroleum Refining Co.				
Szazhalombatta	ref. gas	Claus	77.0	60.0
Tisza Petroleum Refining Co.				
Leninvaros	ref. gas	Claus	24.0	5.3
ISRAEL				
Oil Refineries Ltd.				
Ashdod	HDS & visb	Claus TGT	30.0	30.0
Haifa	FCC	Claus TGT	60.0	30.0
Haifa	HDS & visb	Claus TGT	60.0	30.0
ITALY				
Agip Plus SpA				
Livorno	ref. gas	Claus	60.0	....
Agip Raffinazione SpA				
Rho	ref. gas	Claus	50.0	31.6
Sannazzaro	ref. gas	Claus	90.0	36.0
Taranto	ref. gas	Claus	121.0	55.0
Venezia	ref. gas	Claus	50.0	24.0
API-Raffineria di Ancona SpA				
Falconara	ref. gas	Claus-1 Claus-2	41.0 34.0	35.0 20.0
Esso Italiana				
Augusta	ref. gas	Claus	208.0	80.0
Trecate	ref. gas	Claus	98.0	30.0
Isab				
Melilli	ref. gas	Claus	310.0	214.0
Kuwait Raffinazione E Chimica				
Naples	ref. gas	Claus	70.0	40.0
Raffineria Mediterranea Srl				
Milazzo	ref. gas	Claus	100.0	....
Saras				
Sarroch	ref. gas	Parsons	35.0	(spare)
Sarroch	ref. gas	Parsons	90.0	75.0
Tamoli Italia SpA				
Cremona	ref. gas	Claus	12.0	3.3
Cremona	ref. gas	Claus	30.0	9.8
JAPAN				
Asia Oil Co. Ltd.				
Sakaide	ref. gas	Parsons	80.0	42.0
Sakaide	ref. gas	Udde	185.0	110.0
Yokohama	ref. gas	Parsons	200.0	....
Cosmo Oil Co. Ltd.				
Chiba	ref. gas	Parsons	600.0	260.0
Sakai	ref. gas	Parsons	140.0	50.0
Yokkaichi	ref. gas	Parsons	200.0	45.0
Fuji Oil Co. Ltd.				
Sodegaura, Chiba	ref. gas	Comprimo	150.0	132.5
Sodegaura, Chiba	ref. gas	Parsons	90.0	....
General Sekiyu KK				
Sakai	ref. gas	Claus & Flexsorb SE	193.0	130.0
Idemitsu Kosan Co. Ltd.				
Aichi	ref. gas	Uhde	400.0	196.0
Chiba	ref. gas	Uhde-Parsons	800.0	265.0
Hokkaido	ref. gas	Comprimo	50.0	26.0
Hyogo	ref. gas	Parsons	230.0	105.0
Tokuyama	ref. gas	Girdler-Uhde	235.0	89.0
Kashima Oil Co. Ltd.				
Kashima	ref. gas	Parsons	240.0	150.0
Koa Oil Co Ltd.				
Marifu	sour gas	Claus	45.0	30.0
Marifu	ref. gas	Claus	35.0	4.0
Osaka	ref. gas	Claus	100.0	37.0
Kyokuto Petroleum Industries Ltd.				
Chiba	ref. gas	....	215.0	21.3
Nichimo Sekiyu K.K.				
Kawasaki	ref. gas	....	22.6	....

Company and location		Source	Type of process	- Metric tons/day -		Company and location		Source	Type of process	- Metric tons/day -	
				Design capacity	Production					Design capacity	Production
JAPAN											
Nippon Mining Co. Ltd.											
Chita, Aichi.....	ref. gas	Uhde-Claus	150.0	60.0	PUERTO RICO						
Mizushima.....	ref. gas	Uhde-Claus	200.0	90.0	Caribbean Petroleum Corp.						
Mizushima.....	ref. gas	Comprimo Claus	200.0	90.0	Bayamon.....	ref. gas	Claus		13.0	.....	
Nippon Petroleum Refining Co. Ltd.—Muroran.....											
Negishi.....	ref. gas	Parsons	420.0	154.8	Puerto Rico Sun Oil Co.						
Nippon Steel Chemical Co. Ltd.					Yabucoa.....	ref. gas	Claus		50.0	25.0	
Oita.....	BTX refin.	Scot	3.0	3.0	QATAR						
Tobata.....	coke oven gas	Claus	2.1	2.1	Qatar Petrochemical Co.						
Okinawa Sekiyu Seisai Co. Ltd.											
Okinawa City.....	ref. gas	.....	300.0	180.0	Umm Said.....	assoc. gas	Claus		140.0	147.6	
Seibu Oil Co.					SAUDI ARABIA						
Yamaguchi.....	ref. gas	Comprimo	310.0	173.0	Petromin						
Showa Oil Co.					Berri.....	assoc. gas	Claus		1,200.0	640.0	
Kawasaki.....	fuel oil	.....	80.0	.....	Ras Tanura.....	ref. gas	.....		270.0	71.0	
Showa Yokkaichi Seikyu K.K.					Shedgum.....	assoc. gas	Claus		1,700.0	1,690.0	
Yokkaichi.....	ref. gas	.....	280.0	.....	Uthmaniyah.....	assoc. gas	Claus		1,100.0	1,200.0	
Toa Nenryo Kogyo K.K.					Petromin Mobil Refining Co.						
Kawasaki.....	ref. gas	Claus	295.0	66.0	Yanbu.....	ref. gas	.....		300.0	200.0	
Wakayama.....	ref. gas	Claus	169.0	62.0	Petromin Shell Refining Co.						
Toa Oil Co.					Jubail.....	ref. gas	.....		300.0	161.0	
Kawasaki.....	HDS gases	Claus	330.0	206.0	SINGAPORE						
KOREA											
Ssangyong Refining Co. Ltd.											
Onsan.....	ref. gas	Claus	43.8	28.4	Esso Singapore PVL						
KUWAIT											
Kuwait National Petroleum Co.											
Mina Abdullah.....	ref. gas	Claus	959.0	300.0	Jurong.....	ref. gas	Claus		128.0	14.0	
Mina Al-Ahmadi.....	ref. gas	Claus	1,335.0	700.0	Mobil Oil Singapore pty. Ltd.						
Shuaiba.....	ref. gas	Claus	600.0	280.0	Jurong.....	ref. gas	Claus		110.0	75.0	
Under Normal Capacity											
MEXICO											
Petroles Mexicanos											
Azcapotzalco, DF.....	ref. gas	Claus	22.6	20.0	Shell Eastern Petroleum						
Cadereyta, Ver.....	ref. gas	Claus	71.2	33.4	Pulau Bukom.....	ref. gas	Claus		300.0	42.0	
Cactus, Chis.....	nat. gas	Claus	1,302.0	757.2	Singapore Refining Co. pty. Ltd.*						
Cuidad Madero, Tamps.....	ref. gas	Claus	54.8	26.6	Jurong.....	ref. gas	Claus		257.0	102.0	
Ciudad Pemex, Tab.....	nat. gas	Claus	650.9	400.3	*Singapore Petroleum Co. pty. Ltd. has 36.7% share in design capacity.						
Matapionche, Ver.....	nat. gas	Claus	54.2	23.0	SOUTH AFRICA						
Minatitlan, Ver.....	ref. gas	Claus	71.2	27.7	Mobil Refining Co. of Southern Africa pty. Ltd.						
Nuevo Pemex, Tab.....	nat. gas	Claus	650.9	491.9	Durban.....	ref. gas	.....		70.0	21.0	
Poza Rica, Ver.....	nat. gas	Claus	126.6	36.7	National Petroleum Refiners of South Africa pty. Ltd.						
Salamanca, Gto.....	ref. gas	Claus	153.4	42.3	Sasolburg.....	ref. gas	Claus		100.0	60.0	
Salina Cruz, Oax.....	ref. gas	Claus	71.2	30.1	Shell & BP South Africa Petroleum Refineries pty. Ltd.						
Tula, Hgo.....	ref. gas	Claus	153.7	31.5	Durban.....	ref. gas	.....		106.0	.....	
NETHERLANDS											
BP Raffinaderij Nederland NV											
Rotterdam.....	ref. gas	Claus	270.0	120.0	SPAIN						
Esso Nederland					Ertol Sa						
Rotterdam.....	ref. gas	Claus-TGC	564.0	280.0	La Rabida, Huelva.....	ref. gas	Claus		12.0	8.0	
Kuwait Petroleum Europoort BV					Repsol Petroleo						
Europoort.....	ref. gas	Claus	48.7	43.0	Cartagena.....	ref. gas	Claus		27.0	.....	
Nederlandse Aardolie Maat. BV					La Coruna.....	ref. gas	Claus		49.0	6.1	
Emmen.....	nat. gas	Sulfinol Claus	60.0	20.0	Puerto Real.....	ref. gas	Claus		84.0	37.6	
Shell Nederland Raffinaderij					Tarragona.....	ref. gas	Claus		144.0	73.8	
Rotterdam.....	ref. gas	Claus	540.0	71.0	Petronor						
Pernis.....	ref. gas	Claus	90.0	44.0	Muskiz, Vizcaya.....	ref. gas	Claus		214.0	149.0	
NETHERLANDS ANTILLES											
Refineria Isla Curacao SA											
Emmestad.....	ref. gas	Mod. Claus	225.0	60.0	SWEDEN						
NEW ZEALAND											
New Zealand Refining Co. Ltd.											
Marsden Point, SRU I.....	ref. gas/sour water	Mod. Claus	55.0	34.0	BP Raffinaderi Goteburg AB						
Marsden Point, SRU II.....	ref. gas/sour water	Mod. Claus	55.0	34.0	Gothenburg.....	ref. gas	Claus		6.0	0.3	
Marsden Point, SRU III.....	ref. gas/sour water	Mod. Claus	27.0	27.0	Shell Raffinaderi BV						
NORWAY											
A/S Norske Shell											
Soia.....	ref. gas	Claus	22.0	6.0	Gothenburg.....	ref. gas	Claus		27.0	9.0	
Raffinor AS					Skandinaviska Raffinaderi AB						
Mongstad.....	ref. gas	Claus	13.0	11.0	Lysekil.....	ref. gas	Claus		200.0	71.0	
PORTUGAL											
Petrogal											
Lisbon.....	cat cracking	Claus	30.0	8.3	SWITZERLAND						
Sines.....	ref. gas	Claus	100.0	25.4	Raffinerie de Cressier SA						
PUERTO RICO											
Caribbean Petroleum Corp.											
Bayamon.....	ref. gas	Claus			Cressier.....						
Puerto Rico Sun Oil Co.						ref. gas	Claus		20.0	3.0	
Yabucoa.....	ref. gas	Claus			TURKEY						
Tupras											
					Izmir.....	ref. gas	Claus		40.0	18.0	
					Izmit.....	ref. gas	Claus		47.0	25.0	
					Kirkkale.....	ref. gas	Claus		23.2	7.0	
UNITED KINGDOM											
BP Oil International											
Grangemouth.....	ref. gas	Claus			UNITED KINGDOM						
Llandarcy.....	ref. gas	Claus			BP Oil International						
Conoco Ltd.					Grangemouth.....	ref. gas	Claus		50.0	17.0	
South Humberside.....	ref. gas	.....			Llandarcy.....	ref. gas	Claus		45.0	.....	
Elf U.K.					Conoco Ltd.						
Milford Haven.....	ref. gas	Claus			South Humberside.....	ref. gas	.....		50.0	35.0	
Esso Petroleum Co. Ltd.					Elf U.K.						
Fawley.....	ref. gas	Claus			Milford Haven.....	ref. gas	Claus		76.0	.....	
Gulf Oil Refining Ltd.					Esso Petroleum Co. Ltd.						
Milford Haven.....	ref. gas	.....			Fawley.....	ref. gas	Claus		270.0	118.0	
Lindsey Oil & Refining Ltd.					Gulf Oil Refining Ltd.						
Killingholm, South Humberside.....	ref. gas	Claus			Milford Haven.....	ref. gas	.....		10.0	4.1	
					Lindsey Oil & Refining Ltd.						
					Killingholm, South Humberside.....	ref. gas	Claus		120.0	60.0	

Company and location	Source	Type of process	Metric tons/day - Design capacity		Production
			capac-	ity	
Mobil Oil Co. Ltd.					
Coryton.....	ref. gas	.....	200.0	31.5	
Pembroke Cracking Co.					
Pembroke.....	ref. gas	Claus	160.0	49.0	
Shell U.K. Oil					
Shell Haven.....	ref. gas	Claus	130.0	20.0	
Stanlow.....	ref. gas	Claus	250.0	45.0	
UNITED STATES					
American Central Gas Cos. Inc.					
Odessa, Ector County, Tex.....	nat. gas	Claus	20.0	12.0	
Amoco Oil Co.					
Mandan, N.D.....	ref. gas	Claus	15.0	3.4	
Texas City, Tex.....	ref. gas	Claus	1,270.0	487.6	
Whiting, Ind.....	ref. gas	Claus	490.0	251.7	
Yorktown, Va.....	ref. gas	Claus	66.0	41.6	
Amoco Production Co.					
Andrews County, Tex.....	nat. gas	2 bed Claus and CBA	22.0	16.5	
Ector County, Tex.....	nat. gas	2 bed Claus	30.0	26.6	
Eddy County, N.M.....	nat. gas	2 bed Claus	36.0	17.9	
Fremont County, Wyo.....	nat. gas	2 bed Claus	25.0	16.1	
Hockley County, Tex.....	nat. gas	2 bed Claus	45.0	32.4	
Natrona County, Wyo.....	nat. gas	Locat	1.0	1.0	
Park County, Wyo.....	nat. gas	2 bed Claus	62.0	47.3	
Sweetwater Co., Wyo.....	nat. gas	Locat	4.0	3.0	
Uinta County, Wyo.....	nat. gas	2 bed Claus and CBA	1,200.0	786.0	
Yoakum County, Tex.....	nat. gas	Locat	8.0	4.8	
ARCJO Products Co.					
Carson, Calif.....	ref. gas	Claus	280.0	240.0	
Ferndale, Wash.....	ref. gas	Claus	180.0	165.0	
Ashland Petroleum Co.					
Canton, Ohio.....	ref. gas	Claus	50.0	27.1	
Catlettsburg, Ky.....	ref. gas	Claus	203.2	133.2	
St. Paul, Minn.....	ref. gas	Claus	40.0	18.2	
Birbright Gas Processing Ltd.					
Birbright, Tex.....	nat. gas	Mod. Claus	30.0	5.5	
BP Oil Co.					
Belle Chasse, La.....	ref. gas	Claus-Scot	50.0	.....	
Ferndale, Wash.....	ref. gas	Claus-Scot	19.5	.....	
Lima, Ohio.....	ref. gas	Claus	40.0	.....	
Marcus Hook, Pa.....	ref. gas	Claus-Scot	180.0	.....	
Toledo, Ohio.....	ref. gas	Claus-Scot	112.0	.....	
Cenex					
Laurel, Mont.....	ref. gas	Claus	48.7	20.0	
Champlin Refining and Chemicals Inc.					
Corpus Christi, Tex.....	crude oil	Claus-Scot	250.0	170.0	
Chevron U.S.A. Inc.					
Carter Creek, Wyo.....	nat. gas	Claus	1,015.0	788.0	
El Paso, Tex.....	ref. gas	Claus	42.0	.....	
El Segundo, Calif.....	ref. gas	Claus	750.0	.....	
Pascagoula, Miss.....	ref. gas	Claus	1,000.0	.....	
Philadelphia, Pa.....	ref. gas	Claus	46.0	.....	
Port Arthur, Tex.....	ref. gas	Claus	460.0	.....	
Richmond, Calif.....	ref. gas	Claus	600.0	.....	
Salt Lake City, Utah.....	ref. gas	Claus	12.0	.....	
Citgo Petroleum Corp.					
Lake Charles, La.....	ref. gas	Claus-Sulften	405.0	405.0	
Coastal Refining & Marketing Inc.					
Corpus Christi, Tex.....	ref. gas	Claus	85.0	.....	
Collet Ventures Inc.					
Chatom, Ala.....	sour gas	Claus	140.0	70.0	
Conoco					
Commerce City, Colo.....	ref. gas	Claus	19.0	16.0	
Westlake, La.....	ref. gas	Claus	290.0	195.0	
Crown Central Petroleum Corp.					
Pasadena, Tex.....	ref. gas	Claus	15.0	17.0	
Diamond Shamrock R&M Inc.					
Moore County, Tex.....	ref-nat. gas	Claus	81.3	23.4	
El Paso Natural Gas Co.					
San Juan County, N.M.....	nat. gas	Mod. Claus	53.0	0.0	
Enron Corp.					
Hobbs, N.M.....	nat. gas	Mod. Claus	26.4	12.0	
Barstow, Tex.....	nat. gas	2 bed Claus	68.0	14.0	
Exxon Co.					
Atascosa County, Tex.....	nat. gas	2 reactor split flow Claus	20.0	5.1	
Baton Rouge, La.....	ref. gas	Claus	599.0	253.4	
Baytown, Tex.....	ref. gas	Claus	1,123.0	658.1	
Benicia, Calif.....	ref. gas	Claus	275.0	145.4	
Crane County, Tex.....	nat. gas	2 reactor Claus	.....	11.7	
Escambia County, Ala.....	nat. gas	3 reactor Claus	.....	845.7	
Linden, N.J.....	ref. gas	Claus	393.0	132.7	

Company and location	Source	Type of process	Metric tons/day - Design capacity		Production
			capac-	ity	
Lincoln and Sweetwater Counties, Wyo.....	nat. gas	Claus	1,120.0	1,150.0	
Santa Rosa County, Fla.....	nat. gas	3 reactor Claus	.....	174.9	
Farmland Industries Inc.					
Coffeyville, Kan.....	ref.-acid gas	Claus	25.6	11.7	
Fina Oil & Chemical Co.					
Big Spring, Tex.....	ref. gas	Claus	60.0	55.0	
Port Arthur, Tex.....	ref. gas	Claus-Scot	182.0	119.0	
Fletcher Oil & Refining Co.					
Carson, Cal.....	gas oil-HDS ofgas	NASH	16.0	12.8	
Frontier Oil Corp.					
Cheyenne, Wyo.....	ref. gas	Claus	43.0	38.0	
Gary-Williams Energy Corp.					
Fruita, Colo.....	ref. gas	Claus	9.0	0.0	
Hawaiian Independent Refinery Inc.					
Ewa Beach (SRU I).....	ref. gas	Claus	5.1	0.0	
Ewa Beach (SRU II).....	ref. gas	Claus	14.0	14.0	
Ewa Beach (SRU III).....	ref. gas	Claus	20.0	0.0	
Hunt Refining Co.					
Tuscaloosa, Ala.....	ref. gas	Claus	80.0	30.0	
Koch Hydrocarbon Co.					
McKenzie County, N.D.....	nat. gas	.....	185.0	99.8	
Harmony, Miss.....	nat. gas	.....	10.0	5.6	
Koch Refining Co.					
Corpus Christi, Tex.....	ref. gas	Claus	50.0	10.0	
Rosemount, Minn.....	ref. gas	Claus	447.0	400.0	
LaGloria Oil & Gas Co.					
Tyler, Tex.....	ref. gas	3 stage Claus	9.9	5.7	
Louisiana Land & Exploration Co., Saraland, Ala.....	ref. gas	Claus	50.0	1.5	
Lyondell Petrochemical Co.					
Houston, Tex.....	ref. gas	Claus	355.0	.....	
Mapco Petroleum Inc.					
Memphis, Tenn.....	ref. gas	Claus-Scot	39.0	17.2	
Marathon Oil Co.					
Eddy County, N.M.....	nat. gas	Claus	24.0	18.0	
Hillsdale Co., Mich.....	nat. gas	Locat	0.5	0.2	
Park County, Wyo.....	nat. gas	Claus	4.7	4.0	
Marathon Petroleum Co.					
Detroit, Mich.....	ref. gas	Claus	80.0	31.8	
Garyville, La.....	ref. gas	Claus	450.0	188.8	
Indianapolis, Ind.....	ref. gas	Claus	20.3	5.0	
Robinson, Ill.....	ref. gas	Claus	41.0	31.3	
Mobil Exploration & Producing U.S.—Mary Ann, Ala.....	nat. gas	Claus	229.0	107.0	
Mobil Oil Corp.					
Beaumont, Tex.....	ref. gas	Claus	100.0	.....	
Chalmette, La.....	ref. gas	Claus	250.0	.....	
Joliet, Ill.....	ref. gas	Claus	315.0	.....	
Paulsboro, N.J.....	ref. gas	Claus	135.0	.....	
Torrance, Calif.....	ref. gas	Claus	400.0	.....	
Montana Sulfur & Chemical Co.					
East Billings, Mont.....	ref. gas	Claus	225.0	100.0	
Murphy Oil U.S.A. Inc.					
Meraux, La.....	ref. gas	Claus-Scot	35.0	14.0	
Superior, Wis.....	ref. gas	Claus	14.0	4.0	
Oxy U.S.A. Inc.					
Eutaw, Tex.....	.....	Claus-Scot mod. Claus	840.0	NR	
Milnesand, N.M.....	nat. gas	.....	27.0	8.0	
Myrtle Springs, Tex.....	nat. gas	Claus	216.0	44.7	
Welch, Tex.....	nat. gas	.....	43.0	1.0	
Pennzoil Products Co.					
Shreveport, La.....	ref. gas	Claus	11.7	2.2	
Phibro Energy Inc.					
Houston, Tex.....	ref. gas	Claus	100.0	NR	
Texas City, Tex.....	ref. gas	Claus	50.0	NR	
Phillips 66 Co.					
Andrews, Tex.....	nat. gas	Claus	60.9	29.4	
Artesian, N.M.....	nat. gas	Mod-Claus	55.9	20.3	
Borger, Tex.....	ref. gas	Claus	240.0	.....	
Chatom, Ala.....	nat. gas	Claus	193.0	.....	
Crane, Tex.....	nat. gas	Claus	87.9	23.3	
Eunice, N.M.....	nat. gas	Claus	64.0	19.3	
Goldsmith, Tex.....	nat. gas	Claus	149.3	35.5	
Lee, N.M.....	nat. gas	Claus	26.6	15.2	
Sweeny, Tex.....	ref. gas	Claus	275.0	.....	
Samson Resources Co.—Beckham County, Okla.....	nat. gas	Lo-Cat	5.0	5.0	
Shell Oil Co.					
Anacortes, Wash.....	ref. gas	Claus-Scot	20.0	.....	
Deer Park, Tex.....	ref. gas	Claus-Scot	410.0	.....	
Martinez, Calif.....	ref. gas	Claus-Scot	225.0	.....	
Norco, La.....	ref. gas	Stretford Claus-Scot	45.0	.....	

Company and location	Source	Type of process	- Metric tons/day -	
			Design capacity	Production
Wilmington, Calif.	ref. gas	Claus-Scot	200.0	...
Wood River, Ill.	ref. gas	Claus-Scot	300.0	...
Shell Western E&P Inc.				
Bryans Mill, Tex.	nat. gas	Claus	175.0	...
Denver Unit, Tex.	nat. gas	Claus	4.0	...
Goodwater, Miss.	nat. gas	Claus	50.0	...
Manistee County, Mich.	nat. gas	Claus	25.0	...
Thomasville, Miss.	nat. gas	Claus	1,245.0	...
Sid Richardson Carbon & Gasoline Co.				
Winkler County, Tex.	nat. gas	Selectox	20.0	12.0
Star Enterprise				
Convent, La.	ref. gas	Claus	660.0	...
Delaware City, Del.	ref. gas	Claus	317.0	...
Port Arthur, Tex.	ref. gas	Claus	238.0	...
Texaco Inc.				
Franklin County, Tex.	nat. gas	Claus	219.0	50.0
Freestone County (Aker), Tex.	nat. gas	Claus	181.0	90.0
Freestone County (Teas), Tex.	nat. gas	Claus	138.0	110.0
Texaco Refining & Marketing Inc.—Anacortes, Wash.	ref. gas	Claus	82.0	...
Bakersfield, Calif.	ref. gas	Claus	40.0	...
El Dorado, Kan.	ref. gas	Claus	178.0	...
Wilmington, Calif.	ref. gas	Claus	356.0	...
Texas Oil & Gas Corp.				
Coyanosa, Tex.	nat. gas	Claus	25.0	4.4
Pittsburg, Tex.	nat. gas	Claus	100.0	71.3
Teague, Tex.	nat. gas	Claus	10.0	2.4
Tosco				
Martinez, Calif.	ref. gas	Claus-Scot	181.5	150.0
Total Petroleum Inc.				
Alma, Mich.	ref. gas	Claus	13.2	12.4
Ardmore, Okla.	ref. gas	Claus-Scot	20.3	11.0
Arkansas City, Kan.	ref. gas	Claus	11.2	7.6
Denver, Colo.	ref. gas	Claus	6.1	1.5
Trans-Jeff Chemical Corp.				
Tilden, Tex.-No. 1	acid gas	chance-Claus	19.8	...

Company and location	Source	Type of process	- Metric tons/day -	
			Design capacity	Production
Tilden, Tex.-No. 2	acid gas	chance-Claus	74.9	28.1
Ultramar Refining				
Wilmington, Calif.	crude oil	Claus	128.0	135.0
Unocal Corp.				
Lemont, Ill.	ref. gas	Claus	300.0	...
		Bevon; Stretford		
Lemont, Ill.	ref. gas	Claus	100.0	...
Nederland, Tex.	ref. gas	Claus	17.0	...
Rodeo, Calif.	ref. gas	Claus	350.0	...
		Stretford		
Santa Maria, Calif.	ref. gas	Claus	139.0	...
		Unisulf		
Wilmington, Calif.	ref. gas	Claus	200.0	...
		Stretford		
Valero Refining and Marketing Co.				
Corpus Christi, Tex.	ref. gas	Claus	310.0	250.0
Warren Petroleum Co.				
Como, Hopkins County, Tex.	nat. gas	Claus	75.0	...
Fashion, Atascosa County, Tex.	nat. gas	Claus	36.0	...
Little Knife, Dunn County, N.D.	nat. gas	Claus	125.0	...
Monument, Lea County, N.M.	nat. gas	Claus	32.0	...
Sand Hills, Crane County, Tex.	nat. gas	Claus	45.0	...
Western Gas Processors Ltd.				
San Juan River Plant				
Kirkland, N.M.	H ₂ S	Claus	50.0	22.0
Fairfield, N.D.	H ₂ S	Claus	100.0	30.0
VENEZUELA				
Corpoven				
El Palito, Carabobo	ref. gas	Claus	36.0	19.0
Lagoven				
Amuay, Falcon	ref. gas	Claus	600.0	178.0
Maraven				
Cardon, Falcon	ref. gas	Claus	94.0	30.0

MIDYEAR
Forecast/Review

DRILLING in the U.S. will increase this year if expected oil and gas price gains in the second half encourage operators to spend at budgeted levels. This is Chesapeake Operating Inc. 1 Culpepper A, a horizontal hole drilled into the Upper Cretaceous Austin Chalk in Gonzales County, Tex.



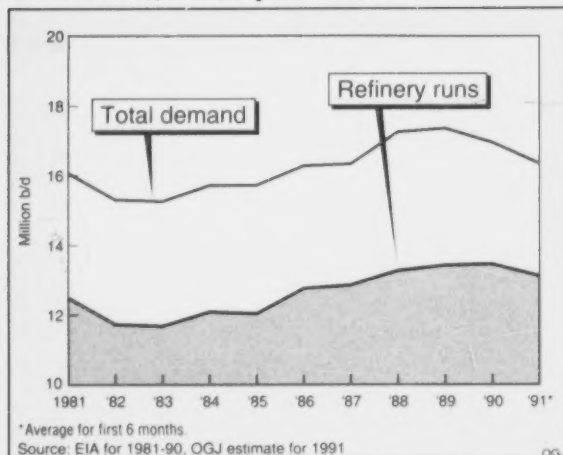
Second half economic gains to lift oil prices

Robert J. Beck
Economics Editor

The oil market is surviving a turbulent 1991 without the price collapse many observers had feared.

An economic recession reduced demand through midyear in the important North American products market. Iraq and Kuwait are still unable to export crude oil, however, and other members of the Organization of Petroleum Exporting Countries have avoided producing more oil than the market needs.

Oil demand, refinery runs down



Crude production up, imports slip

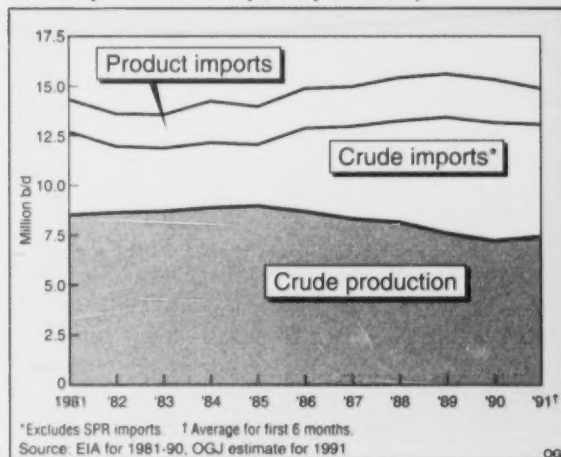
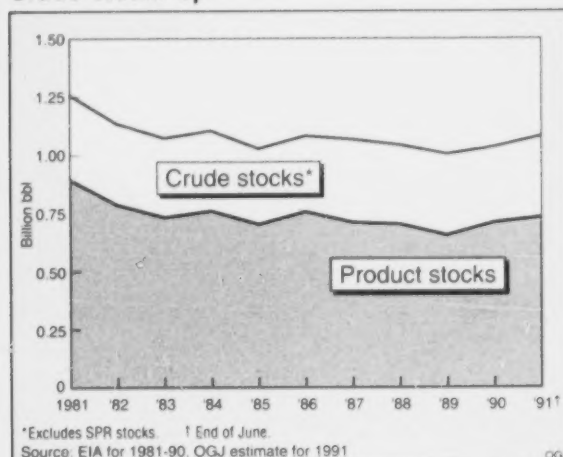


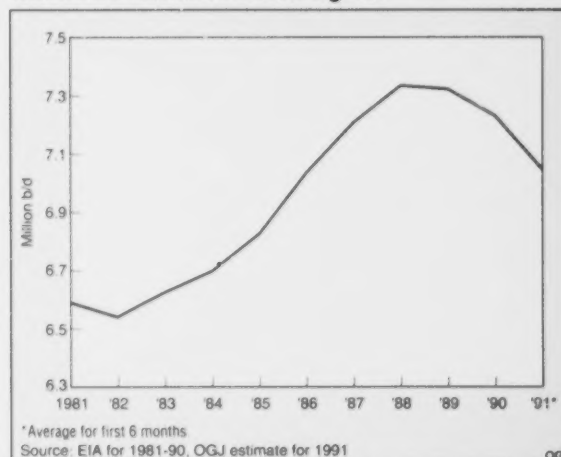
Fig. 3

Fig. 4

Crude stocks up



Gasoline demand down again



Refiners' crude costs fall

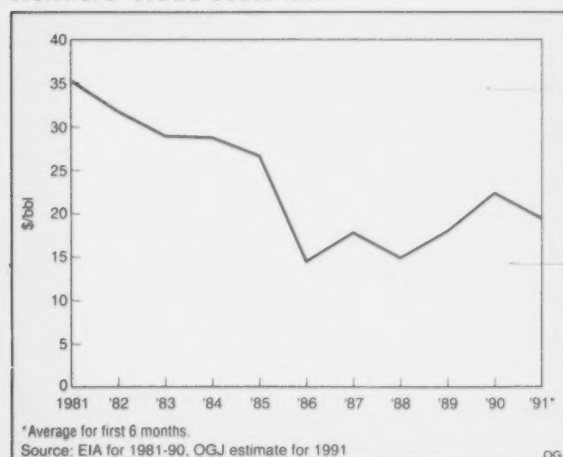


Fig. 5

As a result, crude prices have stabilized. A second half economic recovery would raise demand and prices if production capacity doesn't rise. Timing of the resumption of significant Iraqi and Kuwaiti exports remains the crucial variable.

Crude oil and natural gas prices are still too low to stimulate U.S. exploration and production activity. Worldwide activity is down slightly from levels of a year ago, but there are signs of improvement.

The U.S. rig count was 881 the week of June 28, compared with 1,021 a year earlier. But the count was moving up from a low of 802 in May. The average for the year to

date is 954, compared with 953 in 1990. The international rig count was 905 in May this year, compared with 937 last year. The international count is up from 868 in January.

In the U.S. and elsewhere, demand for crude oil and petroleum products is expected to rebound during the second half.

Crude oil production capacity of members of the Organization of Petroleum Exporting Countries has been reduced to 23-24 million b/d. Fourth quarter demand for OPEC oil is expected to climb to the top of that range, which should lift prices.

In turn, the higher prices will encourage companies to

OGJ forecast of 1991 demand and supply

	First half 1991		Third quarter 1991		Fourth quarter 1991		Year 1991	
	Volume, 1,000 b/d	% change from 1990	Volume, 1,000 b/d	% change from 1990	Volume, 1,000 b/d	% change from 1990	Volume, 1,000 b/d	% change from 1990
Demand								
Motor gasoline	7,050	- 2.0	7,340	- 0.8	7,200	0.7	7,160	- 1.0
Dist. 1-4	5,810	- 2.0	6,065	- 0.8	5,955	0.8	5,910	- 1.0
Dist. 5	1,240	- 1.7	1,275	- 1.2	1,245	0.5	1,250	- 1.0
Naphtha jet fuel	180	- 1.4	190	5.6	190	3.8	185	1.6
Dist. 1-4	130	- 1.9	140	6.1	140	2.2	135	0.7
Dist. 5	50	-	50	4.2	50	8.7	50	4.2
Kerosine jet fuel	1,270	- 5.4	1,320	0.2	1,380	- 0.3	1,310	- 2.2
Dist. 1-4	910	- 5.7	960	1.7	980	- 0.6	940	- 2.7
Dist. 5	360	- 1.1	360	3.5	400	0.5	370	- 1.1
Distillate fuel oil	2,930	- 5.4	2,880	- 1.9	3,220	8.9	2,990	- 1.0
Dist. 1-4	2,510	- 6.0	2,415	- 1.9	2,805	10.2	2,560	- 1.0
Dist. 5	420	- 1.5	465	- 1.9	415	1.0	430	- 1.1
Residual fuel oil	1,140	-13.9	1,100	- 6.4	1,260	15.0	1,160	- 5.6
Dist. 1-4	920	-13.3	850	- 8.0	1,010	15.3	925	- 5.6
Dist. 5	220	-16.3	250	- 0.4	250	13.6	235	- 5.6
LPG and ethane	1,610	7.4	1,480	0.4	1,760	0.5	1,615	3.8
Dist. 1-4	1,550	7.5	1,430	0.1	1,710	0.5	1,560	3.7
Dist. 5	60	4.3	50	16.3	50	-	55	5.8
Other products	2,100	-12.1	2,660	- 2.6	2,240	2.4	2,275	- 6.2
Dist. 1-4	1,850	-11.4	2,340	- 1.9	1,960	3.3	2,000	- 5.4
Dist. 5	250	-16.7	320	- 7.2	280	- 3.8	275	- 11.3
TOTAL DOMESTIC DEMAND	16,280	- 4.3	16,970	- 1.4	17,250	3.2	16,695	- 1.7
Dist. 1-4	13,680	- 4.3	14,200	- 1.3	14,560	3.6	14,030	- 1.6
Dist. 5	2,600	- 4.5	2,770	- 2.0	2,690	1.4	2,665	- 2.4
EXPORTS	1,000	28.6	800	0.3	1,100	2.4	975	13.8
Dist. 1-4	575	48.2	500	9.6	650	3.8	575	23.7
Dist. 5	425	9.1	300	12.3	450	0.4	400	2.0
TOTAL DEMAND	17,280	- 2.9	17,770	- 1.3	18,350	3.2	17,670	- 1.0
Dist. 1-4	14,255	- 2.9	14,700	- 1.0	15,210	3.6	14,605	- 0.8
Dist. 5	3,025	- 2.8	3,070	- 3.1	3,140	1.2	3,065	- 1.9
Supply								
DOMESTIC PRODUCTION								
Crude & lease condensate	7,420	0.5	7,320	1.3	7,200	- 3.0	7,340	- 0.2
Dist. 1-4	4,610	0.3	4,550	- 0.2	4,430	- 4.2	4,550	- 1.3
Dist. 5	2,810	1.8	2,770	3.8	2,770	- 0.9	2,790	1.6
NGL and other hydrocarbons	1,740	8.9	1,660	2.2	1,660	- 4.4	1,700	3.7
Dist. 1-4	1,635	8.7	1,565	2.0	1,565	- 4.2	1,600	3.6
Dist. 5	105	11.7	95	6.7	95	6.9	100	5.3
Total domestic production	9,160	2.0	8,980	1.4	8,860	- 3.3	9,040	0.5
Dist. 1-4	6,245	1.9	6,115	0.3	5,995	- 4.2	6,150	- 0.1
Dist. 5	2,915	2.1	2,865	3.9	2,865	- 1.1	2,890	1.7
IMPORTS								
Crude	5,700	- 7.5	6,300	0.1	5,940	20.2	5,910	0.7
Dist. 1-4	5,520	- 5.7	6,070	-	5,730	20.3	5,710	1.3
Dist. 5	180	-31.7	230	4.1	210	16.0	200	-13.8
Products & unfinished oils	1,690	-28.0	1,990	- 1.8	1,830	3.0	1,800	-15.3
Dist. 1-4	1,640	-27.8	1,920	- 1.8	1,760	2.9	1,740	-15.1
Dist. 5	50	-35.9	70	- 1.4	70	6.1	60	-18.9
Total imports	7,390	-12.7	8,290	- 0.3	7,770	15.6	7,710	- 3.5
Dist. 1-4	7,160	-11.8	7,990	- 0.5	7,490	15.7	7,450	- 3.1
Dist. 5	230	-32.7	300	2.7	280	13.4	260	-15.0
OTHER SUPPLY								
Processing gain, loss, etc.	950	9.3	910	- 4.3	930	-15.9	935	- 1.8
Dist. 1-4	820	9.5	790	- 2.1	770	-15.5	800	- 0.7
Dist. 5	130	7.9	120	-16.7	160	-17.9	135	- 7.5
TOTAL NEW SUPPLY	17,500	- 4.5	18,180	0.3	17,560	3.4	17,685	- 1.4
Dist. 1-4	14,225	- 5.2	14,895	0.2	14,255	4.5	14,400	- 1.7
Dist. 5	3,275	- 1.2	3,285	2.9	3,305	- 1.0	3,285	- 0.2
STOCK CHANGE								
Dist. 1-4	220	-	410	-	(790)	-	15	-
Dist. 5	(30)	-	195	-	(955)	-	(205)	-
Dist. 5	250	-	215	-	165	-	220	-
CRUDE RUNS TO STILL	13,130	- 1.5	13,460	- 4.9	13,000	1.3	13,180	- 1.7
TOTAL INPUT TO STILL	13,320	- 1.5	13,650	- 4.6	13,190	0.9	13,370	- 1.8
TOTAL REFINERY CAPACITY	15,670	0.6	15,670	-	15,670	-	15,670	0.3
REFINERY UTILIZATION (%)	85.0	- 2.1	87.1	- 4.3	84.2	0.2	85.3	- 2.1
TOTAL INDUSTRY STOCKS*	1,080	- 1.6	1,115	0.6	1,040	0.5	1,040	0.5
Refined products*	730	2.2	775	1.3	700	- 1.7	700	- 1.7
Crude*	350	- 8.9	340	- 0.9	340	5.3	340	5.3
SPR crude stocks*	568	3.2	573	- 2.9	578	- 1.4	578	- 1.4

* Million bbl at end of period.

First half U.S. crude, condensate production

	First half 1991*	First half 1990	Change, %
	1,000 b/d		
PAD District 1	28	32	-13.0
Florida	13	18	-26.4
Others	15	14	3.4
PAD District 2	736	745	-1.3
Illinois	87	55	3.6
Kansas	149	150	-0.7
Michigan	54	55	-1.5
North Dakota	101	101	0.2
Oklahoma	302	311	-2.9
Others	72	73	-1.8
PAD District 3	3,341	3,345	-0.1
Alabama	53	52	2.9
Arkansas	29	30	-3.3
Louisiana	1,051	1,091	-3.7
Mississippi	72	74	-2.3
New Mexico	191	184	3.8
Texas	1,945	1,914	1.6
PAD District 4	488	505	-3.3
Colorado	80	85	-5.3
Montana	53	55	-3.6
Utah	74	77	-4.3
Wyoming	281	288	-2.5
PAD District 5	2,828	2,760	2.5
Alaska	1,840	1,783	3.2
California	961	952	1.0
Others	27	26	5.2
Total	7,420	7,386	0.5
* Estimate.			

release some of the exploration funds they budgeted this year but have so far been reluctant to spend.

In the U.S., petroleum product demand was down sharply in the first half due to recession. Demand will be higher in the second half than in the first if the economy recovers as expected and if fourth quarter weather is normal. The year's demand will remain below that of 1990 nevertheless.

U.S. production is up this year because of an increase in Alaskan output following North Slope maintenance projects that trimmed flow last year. Total U.S. crude production will be down marginally for the year, and total liquids output will exceed 1990 levels.

The higher domestic output and lower demand will reduce U.S. imports in 1991.

Product prices have held up despite the slump in demand. Refining margins have been strong as a consequence. Product exports in-

creased in the first half.

Highlights

Here are highlights of Oil & Gas Journal's midyear U.S. forecast for all of 1991:

- Demand for petroleum products will drop 1.7% from the level a year ago. This is a sharper fall than the 0.6% decline forecast at the beginning of the year (OGJ, Jan. 28, p. 49).

- Demand for motor gasoline will decline 1% for the year but rebound in the last quarter as the economy recovers.

- Crude and condensate production will slip by 0.2%, a much smaller decline than the 2.5% anticipated in January. In addition to the Alaskan gain, Lower 48 output held up in the first half of the year on the strength of oil prices elevated during the Persian Gulf crisis.

- Total imports will fall 3.5% in 1991 due to weak first half demand and the production gain. Product imports will be down 15.2% as refin-

U.S. crude and products prices

Year	Average wellhead crude price, \$/bbl	Refiner's acquisition cost of crude, \$/bbl	Retail motor gasoline, all types, \$/gal	Residential heating oil, \$/gal	Average wellhead natural gas price, \$/Mcf
1976	8.19	10.69	59.5	40.6	0.58
1977	8.57	11.96	63.1	46.0	0.79
1978	9.00	12.46	65.2	49.0	0.91
1979	12.64	17.72	88.2	70.4	1.18
1980	21.59	28.07	122.1	97.4	1.58
1981	31.77	35.24	135.3	119.4	1.98
1982	28.52	31.67	128.1	116.0	2.46
1983	26.19	28.99	122.5	107.6	2.59
1984	25.88	28.63	119.6	109.1	2.66
1985	24.09	26.75	119.6	105.3	2.51
1986	12.51	14.55	93.1	83.6	1.94
1987	15.40	17.90	95.7	80.3	1.67
1988	12.58	14.67	96.3	81.3	1.69
1989	15.86	17.97	108.0	90.0	1.69
1990	20.03	22.23	121.7	106.2	1.72
1991E	16.95	19.65	125.0	104.7	1.70

Source: 1976-1990 EIA; 1991 OGJ estimate.

ers and marketers rely on domestic refinery output until demand picks up later in the year. Imported crude and products will represent 46.2% of consumption this year vs. 47% in 1990. The record high was 47.7% in 1977.

- Refinery runs will be off 1.7% in 1991 due to lower product demand. The refinery utilization rate is expected to drop to 85.3% from 87.1% in 1990.

- Average crude oil prices will be down 15.4% from last year, when prices jumped during the Middle East crisis.

- Yearend total industry stocks will be up 0.5% from their levels a year earlier. Crude stocks are expected to rise to 340 million bbl, a contingency level allowing refiners flexibility to deal with rapidly changing product demand patterns. Modest crude oil prices will also encourage refiners to add to crude stocks before the winter heating season. Product stocks are expected to fall along with demand by 1.7%.

The outlook

The second half demand rebound expected to accompany economic recovery and a return to normal late year weather won't be strong enough to offset the first half slump.

Oil & Gas Journal forecasts average U.S. demand for all petroleum products at 16.695 million b/d, compared with 16.988 million b/d in 1990. It will be the second

consecutive year of declining petroleum product demand.

First half 1991 demand is estimated at 16.28 million b/d, down 4.3% from the first half a year ago. Demand for the second half of 1991 is expected to move up 0.9% from the corresponding period last year to 17.11 million b/d.

Total demand, including exports of crude oil and products, will fall 1% to 17.67 million b/d for 1991. Exports will increase 13.8% to 975,000 b/d. First half exports, mainly of products, were up 28.6% at an estimated 1 million b/d.

The demand projection is 245,000 b/d lower than OGJ's forecast earlier in the year. The adjustment reflects the first half's steeper than expected economic decline and warmer than normal first quarter weather.

Demand declines are projected for motor gasoline, kerosine jet fuel, distillates, residual fuel oil, and other products. Increases are projected for naphtha jet fuel, LPG, and ethane.

The motor gasoline demand slump comes as improvements in vehicle fuel efficiency combine with reductions in miles driven per vehicle due to the recession. This will more than offset an increase in the vehicle fleet.

U.S. crude oil and condensate production will average 7.34 million b/d. Alaskan production started to decline in 1989, but last summer's

Energy consumption and efficiency

Year	GNP, Billion 1982 \$	Energy consumption, Trillion BTU	Energy consumption per GNP \$, 1,000 BTU	Oil consumption, Trillion BTU	Oil consumption per GNP \$, 1,000 BTU
1929	711.8	23,756	33.4	5,521	7.8
1933	501.6	16,900	33.7	4,833	9.6
1940	775.0	23,589	30.4	7,407	9.6
1946	1,077.8	30,494	28.3	10,002	9.3
1950	1,206.6	33,992	28.2	13,489	11.2
1955	1,494.9	39,703	26.6	17,524	11.7
1960	1,685.3	44,569	26.8	20,067	12.1
1965	2,067.6	53,343	25.6	23,242	11.1
1970	2,416.2	67,143	27.8	29,537	12.2
1971	2,484.8	68,348	27.5	30,570	12.3
1972	2,608.5	71,643	27.5	32,966	12.6
1973	2,744.1	74,282	27.1	34,840	12.7
1974	2,729.3	72,543	26.6	33,455	12.3
1975	2,695.0	70,546	26.2	32,731	12.1
1976	2,826.7	74,362	26.3	35,175	12.4
1977	2,958.6	76,289	25.8	37,122	12.5
1978	3,115.2	78,068	25.1	37,965	12.2
1979	3,182.4	78,698	24.7	37,123	11.6
1980	3,187.1	75,952	23.8	34,202	10.7
1981	3,248.8	73,989	22.8	31,931	9.8
1982	3,166.0	70,840	22.4	30,232	9.5
1983	3,279.1	70,497	21.5	30,054	9.2
1984	3,501.4	74,101	21.2	31,051	8.9
1985	3,618.7	73,945	20.4	30,922	8.5
1986	3,717.9	74,237	20.0	32,196	8.7
1987	3,853.7	76,845	19.9	32,865	8.5
1988	4,116.9	80,195	19.5	34,222	8.3
1989	4,117.7	81,345	19.8	34,211	8.3
1990	4,157.3	81,490	19.6	33,644	8.1
1991*	4,140.0	81,210	19.6	33,080	8.0
Percentage change					
1929-40	8.9	- 0.7	- 9.0	34.2	23.1
1940-50	55.7	44.1	- 7.2	82.1	16.7
1950-70	100.2	97.5	- 1.4	119.0	8.9
1970-90	72.1	21.4	-29.5	13.9	-33.6

* Estimate.

U.S. energy demand

	1989		% change 1990/89	1991		% change 1991/90	% of total energy		
	1989	1990		1991	1991		1989	1990	1991
	- Trillion BTU -			Trillion BTU					
Oil	34,211	33,644	- 1.7	33,080	- 1.7	- 1.7	42.1	41.3	40.7
Natural gas	19,382	19,418	+ 0.2	19,440	+ 0.1	+ 0.1	23.8	23.8	24.0
Coal	18,944	19,094	+ 0.8	19,180	+ 0.5	+ 0.5	23.3	23.4	23.6
Nuclear	5,677	6,186	+ 9.0	6,180	- 0.4	- 0.4	7.0	7.6	7.6
Hydro & other	3,131	3,148	+ 0.5	3,350	+ 6.4	+ 6.4	3.8	3.9	4.1
Total	81,345	81,490	+ 0.2	81,210	- 0.3	- 0.3	100.0	100.0	100.0

Source: 1989 and 1990, EIA; 1991 OGJ estimate.

maintenance work exaggerated the rate of decline in 1990. The temporary Alaskan gain and Lower 48 drilling stimulated by last year's price jumps will help slow the overall U.S. production decline rate in 1991.

Lower 48 output will slip only 1.1% in 1991 to 5.52 million b/d. The 0.2% drop in total U.S. output follows a 3.4% decline last year and 6.5% the year before. The expected 1991 production average will be the lowest since 1962.

Total petroleum imports will average 7.71 million b/d.

Contrasting the crude stock gain, product stocks will slide to 700 million bbl. Product stocks dipped close to minimum operating levels at 660 million bbl at yearend 1989 but recovered last year to 712 million bbl.

Refinery crude runs will slip to 13.18 million b/d, and average refining capacity will be up 0.3% at 15.67 million b/d.

Product prices are expected to hold up better than

crude prices in 1991 even though demand is down.

Prices

The average price for world export crudes fell from \$24.72/bbl at the end of 1990 to \$15.34/bbl the week of Mar. 1. Since then crude prices have been stable in a range of \$15.50-17/bbl.

Last year, before Iraq invaded Kuwait, OPEC production in excess of demand weakened prices, raising new fears of a price collapse.

The situation has changed

markedly due to the Iraqi-Kuwaiti conflict. Kuwait's production capacity was destroyed, and Iraq's output is curtailed by a United Nations export embargo. OPEC countries that raised output to meet demand during late 1990 have shown sufficient discipline to balance the market at the current price level.

Last year the average world export price dropped from an average \$19.27/bbl in January to \$13.51/bbl in June, averaging \$16.33/bbl for the half. This year's first half average was \$17.46/bbl. The June price this year was up 19.9% from a year earlier at \$16.18/bbl.

The key to price stability this year is OPEC production at or near the level required to maintain a supply/demand balance. OPEC set a production quota of 22.3 million b/d starting Apr. 1 and renewed it for the third quarter. According to the International Energy Agency, demand for OPEC crude oil averaged 23.1 million b/d in the first quarter. IEA estimates it at 21.1 million b/d in the second quarter and projects demand at 21.8 million b/d in the third quarter, depending upon changes in stocks. IEA has estimated OPEC output during April and May at an average 22.25 million b/d. This output level is below the quota and slightly above the estimated demand.

Elsewhere, summer maintenance projects will reduce output in the North Sea, which will help OPEC prevent a global surplus. Crude prices therefore will remain close to current levels until demand starts rising at the end of the third quarter. OGJ projects an export price average for the year of \$18/bbl.

The U.S. average wellhead price of crude averaged \$17.89/bbl for January and February—latest months for which figures are available—compared with \$18.34/bbl for January and February a year ago. Last year the price dropped to \$12.79/bbl by June. OGJ projects an average U.S. wellhead price of \$16.95/bbl for 1991, down 15.4% from 1990.

U.S. product prices are not showing much weakness de-

U.S. natural gas supply and demand

	1988	1989	1990	% change 1990/89	1991 bcf	% change 1991/90
	bcf					
Production						
Texas.....	6,286	6,241	6,352	1.8	6,280	- 1.1
Louisiana.....	5,180	5,078	5,236	3.2	5,100	- 2.6
Other states.....	6,375	6,710	6,879	2.5	6,820	- 0.9
Total production....	17,841	18,029	18,469	2.4	18,200	- 1.5
Imports						
Canada.....	1,277	1,340	1,426	6.6	1,495	4.7
Mexico.....	0	0	0	—	0	—
LNG.....	17	42	84	100.0	75	- 10.7
Total imports.....	1,294	1,382	1,512	9.4	1,570	3.8
Supplemental gas.....	101	107	105	- 1.9	110	4.8
Losses, etc.*.....	- 1,191	- 933	- 635	- 31.9	- 930	46.5
Total new supply...	18,045	18,585	19,451	4.7	18,950	- 2.6
Supply from storage.....	59	321	- 518	—	—	—
Total supply.....	18,104	18,906	18,933	0.1	18,950	0.1
Exports.....	74	107	99	- 7.5	100	1.0
Total consumption	18,030	18,799	18,834	0.2	18,850	0.1

*Extraction losses and unaccounted for natural gas.
Source: 1988, 1989 and 1990 EIA; 1991 OGJ estimate.

U.S. refinery utilization

	Crude runs	Input to distillation units	Operable capacity	Utilization rate, %
	1,000 b/d			
1981	12,471	12,751	18,603	68.5
1982	11,766	12,176	17,445	69.8
1983	11,345	11,645	16,831	69.2
1984	12,044	12,335	16,034	76.9
1985	12,002	12,161	15,671	77.6
1986	12,716	12,817	15,467	82.9
1987	12,851	12,999	15,643	83.1
1988	13,246	13,447	15,927	84.4
1989	13,401	13,551	15,701	86.3
1990	13,409	13,610	15,623	87.1
1991*	13,180	13,360	15,670	85.4
1981-1991				
change Volume	-12,471	-12,751	-18,603	-69.0
Percent	-100.0	-100.0	-100.0	-100.0
1990-91				
change Volume	-13,409	-13,610	-15,623	-87.1
Percent	100.0	100.0	100.0	100.0

*OGJ estimate.
Source: EIA.

spite the demand slump. Even though U.S. demand has fallen for many products refiners have been able to maintain product price levels comparable to last year's. With product exports up sharply in the first half, it appears that worldwide product demand and refining capacities are affecting U.S. product prices more than in previous years.

The OGJ survey of self-service unleaded motor gasoline pump prices shows the

average price for the first half of 1991 at \$1.165/gal, compared with \$1.0455/gal last year. The price at the end of June was \$1.1496/gal vs. \$1.0581/gal a year earlier. These current year prices include the 5c/gal federal tax that didn't exist a year earlier.

The price excluding tax averaged 85.42c/gal for the first 6 months of 1991 vs. 79.53c/gal in 1990 up 7.4%. For the first 6 months this is consistent with crude prices, which on average were up 6.9%.

Gasoline taxes for the first half of 1991 averaged 31.02c/gal, up from 25.02c/gal in the same period last year—an increase in taxes of 24.2%.

There is some difference between the U.S. gasoline markets this year and the markets a year ago. A year earlier marketers were able to maintain gasoline prices in May and June, at the start of the driving season, at the same level as the first quarter even though crude prices had plummeted 30%. The price level was sustained due to the surge in motor gasoline demand during the summer months. This helped boost refining margins.

This year the surge in demand has not fully materialized. Refiners, unable to boost summer gasoline prices, have to settle for somewhat smaller margins.

OGJ expects the pump price for all types of motor gasoline, including premium grades, to average \$1.25/gal for 1991, compared with \$1.217/gal for 1990. All the increase is attributable to the higher federal tax. The U.S. peak pump price came in 1981, when all motor gasoline grades averaged \$1.353/gal.

Residential heating oil prices for the first 3 months of

1991 averaged \$1.0987/gal, compared with \$1.0167/gal in the same period last year. The increase was due mainly to strong demand in January and slightly higher feedstock costs during the first quarter. OGJ expects heating oil prices to average \$1.047/gal for the year vs. \$1.062/gal last year.

Consumption of natural gas is expected to rise slightly this year as demand stimulated by low prices offsets the effects of recession. The U.S. wellhead price for natural gas will average \$1.70/Mcf in 1991, compared with \$1.72/Mcf last year and \$1.69/Mcf in 1988 and 1989.

Gas prices peaked in 1984 at \$2.66/Mcf, falling with weakening demand to \$1.67/Mcf in 1987. The average annual price has been relatively constant since then, but there have been sharp seasonal swings in price related to demand.

Natural gas consumption in the U.S. was 17.951 tcf in 1984. It fell to 16.221 tcf in 1986 and rebounded to 18.834 tcf last year.

Energy demand

Late in 1990 the U.S. economy went into its first recession since 1982. Economic activity began lagging year-earlier levels in the fourth quarter of 1991 in a trend that continued through first half 1991.

The recession ended a record 8 year period of growth in gross national product (GNP).

OGJ expects economic growth to resume during the second half. For the year, real GNP will decline 0.4% in 1991 following a 0.9% increase in 1990. GNP increased 31.3% during the growth period that ended last year, averaging 3.1%/year.

Energy consumption, which declined in the early 1980s, moved up 15.0% during the growth period, an average rate of increase of 1.8%/year. Last year energy consumption increased 0.2%, following increases of 1.4% in 1989 and 4.4% in 1988.

In recent years energy consumption growth has

First quarter worldwide production

Country	First quarter 1991	First quarter 1990 1,000 b/d	Change	Change, %
OPEC	23,068	24,136	-1,068	-4.4
Non-OPEC	37,165	37,617	-452	-1.2
Argentina	489	474	15	3.2
Brazil	637	632	5	0.8
Canada	1,520	1,523	-3	-0.2
Colombia	400	420	-20	-4.8
Mexico	2,768	2,612	156	6.0
United States	7,450	7,460	-10	-0.1
Other	332	343	-11	-3.2
Western Hemisphere	13,596	13,464	132	1.0
Norway	1,854	1,577	277	17.6
United Kingdom	1,831	1,899	-68	-3.6
Other	568	542	26	4.8
Western Europe	4,253	4,018	235	5.8
U.S.S.R.	10,700	11,761	-1,061	-9.0
Other	311	311	-	-
Eastern Europe & USSR	11,011	12,072	-1,061	-8.8
Angola	497	470	27	5.7
Egypt	892	860	32	3.7
Other	454	463	-9	-1.9
Africa	1,843	1,793	50	2.8
Oman	730	640	90	14.1
Syria	460	370	90	24.3
Other	251	232	19	8.2
Middle East	1,441	1,242	199	16.0
Australia	514	611	-97	-15.9
China	2,798	2,758	40	1.5
India	679	701	-22	-3.1
Malaysia	650	620	30	4.8
Other	380	338	42	12.4
Asia-Pacific	5,021	5,026	-7	-0.1
Total World	60,233	61,753	-1,520	-2.5

Source: Oil & Gas Journal

OPEC production

Country	First quarter 1991	First quarter 1990 1,000 b/d	Change	Change, %	OPEC quota 1,000 b/d
Algeria.....	793	810	-17	-2.1	830
Ecuador.....	290	280	10	3.6	270
Gabon.....	300	263	37	14.1	290
Indonesia.....	1,438	1,267	171	13.5	1,440
Iran.....	3,151	3,011	140	4.6	3,220
Iraq.....	203	3,112	-2,909	-93.5	-
Kuwait.....	100	1,817	-1,717	-94.5	-
Libya.....	1,500	1,350	150	11.1	1,430
Neutral Zone*	28	393	-365	-92.9	-
Nigeria.....	1,900	1,800	100	5.6	1,840
Qatar.....	383	377	6	1.6	400
Saudi Arabia.....	8,162	5,569	2,593	46.6	8,030
United Arab Emirates.....	2,487	2,070	417	20.1	2,320
Venezuela.....	2,333	2,017	316	15.7	2,240
Total OPEC.....	23,068	24,136	-1,068	-4.4	22,310

*Shared by Kuwait and Saudi Arabia.

moved back toward alignment with economic growth. In the 4 years ending with 1990, GNP increased by 11.8%, and energy consumption increased 9.8%. Relatively low energy prices and renewed growth in energy intensive industries boosted energy consumption.

Energy consumption is expected to fall in 1991 due to the slump in economic activity. Total energy consumption will slip 0.3% to 81.21 quadrillion BTU (quads) for 1991. There will be no measurable improvement in overall energy efficiency this year; the decline in GNP will be greater than the decline in energy consumption.

Energy consumption per unit of GNP has been falling since 1970, dropping 29.5% by 1990. From 27,800 BTU/\$ of GNP in 1970, the ratio fell to 19,600 BTU/\$ in 1990. The ratio will be unchanged this year.

Oil energy demand is expected to slip 1.7% in 1991 to 33.08 quads. Oil's share of total energy demand will also fall, dropping to 40.7% from 41.3% last year and 42.1% in 1989.

Demand for energy from natural gas will move up 0.1% to 19.44 quads. This follows a 0.2% increase last year. The gas market share will move up to 24% from 23.8% in 1989 and 1990.

Energy from coal will continue to climb on the strength of increased electricity demand. Coal consumption will move up 0.5% to 19.18 quads, and coal market share will rise to 23.6% from 23.4% last year.

Hydroelectric and geothermal energy output will increase 6.4% to 3.35 quads. The market share will move up to 4.1% from 3.9% last year. Hydro power output has been well below capacity the last several years because of drought conditions in the western U.S.

Nuclear energy output will decline by 0.4% to 6.16 quads this year. Nuclear output gained 9% last year. The market share will remain at 7.6% of total energy. Nuclear plant operating rates are expected to drop in 1991 with more intense plant maintenance.

First half crude and products stocks*

	1,000 bbl 1991	Change 1991/90, %	1,000 bbl 1990	Change 1990/89, %	1,000 bbl 1989
Motor gasoline	219,000	3.0	212,602	- 1.7	216,353
Naphtha jet fuel	7,500	7.6	6,969	12.4	6,200
Kerosene jet fuel	38,000	- 5.8	40,357	5.1	38,408
Distillate fuel oil	111,200	1.2	109,885	10.3	99,613
Residual fuel oil	45,500	- 2.7	46,769	8.0	44,101
Unfinished oils	110,600	- 5.7	117,238	3.1	113,681
Other	188,200	- 6.7	180,312	- 3.2	186,322
Total products stocks	780,000	-2.0	714,132	1.3	704,678
Crude stocks	340,000	-11.5	384,223	18.0	331,282
Total	1,040,000	- 5.3	1,098,355	6.0	1,035,940

*Excludes Strategic Petroleum Reserve. †At end of June.
Source: 1989-90, EIA; 1991, OGI estimate.

narice.

Few new nuclear plants are planned. The slowing of the growth in nuclear power will mean that the electric power industry will have to turn to other fuel sources in the future, most probably coal and natural gas.

Oil product demand

Motor gasoline demand slipped 2.0% during the first half, averaging 7.05 million b/d due to the recession and higher prices.

First half distillate fuel oil demand was down 5.4% from a year ago at 2.93 million b/d. Diesel fuel demand suffered from reduced business shipments, and conservation, higher prices, competition from natural gas, and warm weather reduced demand for home heating oil. Prices for residential No. 2 distillate averaged \$1.099/gal in the first quarter, up 8% from the same period of 1990.

Demand for residual fuel oil during the first half was down 13.9% from the first half of 1990, averaging 1.14 million b/d. In the electric utility sector consumption of coal and natural gas moved up, while demand for fuel oil fell. The resid demand drop in this sector during January and February amounted to 15.7%.

Second half products demand is expected increase 2.3% from the same period a year ago, averaging 16.83

million b/d. All the improvement will occur in the fourth quarter, with demand up 3.2% at 17.25 million b/d. Fourth quarter 1990 demand was severely depressed by the economic downturn, prices elevated by the Persian Gulf crisis, and weather 10% warmer than normal.

For the year OGI is expecting demand for petroleum products to average 16.695 million b/d, down 1.7%.

Until 1990, products demand had increased every year since 1983. Demand hit an all time high of 18.847 million b/d in 1978 and then slipped to 15.231 million b/d in 1983 before starting to move back up. Demand reached 17.325 million b/d in 1989. The demand projected for 1991 will about match that of 1987.

Motor gasoline demand will be down for the third consecutive year, averaging 7.16 million b/d vs. 7.235 million b/d in 1990.

Gasoline prices at midyear were up 11% from a year earlier but were still well below the peak prices of the early 1980s.

Gasoline demand has been sliding slowly since 1988, when it averaged 7.336 million b/d. The average slipped to 7.328 million b/d in 1989 and 7.213 million b/d last year. The peak year for motor gasoline demand was 1978 at 7.412 million b/d; the recent low was 6.529

million b/d in 1982.

Distillate demand will average 2.99 million b/d this year, compared with 3.021 million b/d in 1990. In the fourth quarter alone, however, distillate demand will be up 8.9% from a year earlier at 3.22 million b/d. Some base load demand for home heating oil has been lost to natural gas. Improvements in heating unit efficiency also will suppress demand. Residential distillate demand for the year is expected to be down from 1990.

Residual fuel oil prices during the second half of 1991 are expected to be far below the level a year earlier. The sharp jump in crude oil prices at the end of 1990 pushed the price of residual fuel oil to a level 50% above the previous year. As a result the fuel lost market share to coal and natural gas in a trend that carried into the first half of 1991.

This year the price of natural gas is expected to rebound in the heating season, improving the competitive position of resid. As a result residual fuel oil demand is projected to average 1.19 million b/d for the second half, up 4.8% from the same period of 1990. Demand in the fourth quarter is projected at 1.26 million b/d, up 15% from 1990.

However, due to the weak first half, average demand for the year will be down 5.6% at 1.16 million b/d. Much of the

decline will be a drop in consumption by electric utilities, most of which can switch to natural gas or other fuels when the oil price gets too high. In January 1989, the cost of heavy fuel oil delivered to steam-electric utility plants was only 2.6% higher than natural gas on a BTU basis. In January 1990, it was 37.4% higher than natural gas, and this January it was 27.2% higher.

Demand for LPG and ethane is projected to average 1.615 million b/d in 1991, up 3.8% from 1990. Demand during the first half was 1.61 million b/d, up 7.4%. Chemical demand is expected to rebound along with residential/commercial demand with the return to normal winter weather.

Demand for all other petroleum products is expected to fall this year by 6.2% to 2.275 million b/d. Included in this category are petrochemical feedstocks, special naphthas, lubricants, waxes, petroleum coke, asphalt and road oil, still gas, and miscellaneous products. Demand for several of these products is expected to be down, with a substantial drop in petrochemical feedstocks and petroleum coke.

Natural gas

U.S. demand for natural gas is projected to increase 0.1% in 1991 to 18.85 tcf. This follows increases of 0.2% in 1990, 4.3% in 1989, and 4.8% in 1988.

During 1986-90, demand moved up 2.613 tcf. The industrial sector accounted for 61% of the increase, but demand also moved up in the residential and commercial sectors.

This year industrial demand will sag due to the sluggish economy, but residential, commercial, and utility demand increases will offset the decline. Late in the year, a normal winter would boost demand for gas, but competition from low-cost fuel oil would reduce the gain as gas prices increase.

Especially against resid, gas won't enjoy the cost advantage that it did late in 1990. Increased output by hydropower plants also will

World crude prices

Country	Type of crude and API gravity	Current price,* \$/bbl	Change 8-'91 1-'91 %	In effect Jan. 1, 1991, \$/bbl	Change '91/'90 %	In effect Jan. 1, 1990, \$/bbl	In effect Jan. 1, 1989, \$/bbl	In effect Jan. 1, 1988, \$/bbl	In effect Jan. 1, 1987, \$/bbl
OPEC									
Saudi Arabia	Arabian light 34°	16.00	-33.3	24.00	30.4	18.40	13.15	17.52	16.15
Abu Dhabi	Murban 35°	16.65	-32.5	24.65	29.4	19.05	13.70	17.92	16.55
Algeria	Saharan 44°	16.50	-35.9	26.85	36.4	21.15	16.10	18.87	17.30
Nigeria	Bonny light 37°	16.25	-34.4	27.80	31.1	21.20	16.05	18.92	17.13
Libya	Ea Sider 37°	17.10	-36.4	26.90	31.9	20.40	15.40	18.52	16.95
Indonesia	Minas 34°	18.10	-31.7	26.50	42.9	18.55	15.50	17.56	16.28
Venezuela	Tia Juana 31°	17.70	-38.2	28.62	15.9	24.69	12.27	17.62	16.10
Total OPEC		15.81	-34.6	24.18	29.2	18.72	13.36	16.77	16.10
OTHER									
U.K.	Brent blend 38°	17.70	-34.9	27.20	29.5	21.00	15.80	16.00	16.25
Norway	Ekofisk 42°	18.20	-33.2	27.25	31.3	20.75	15.85	17.60	16.86
Mexico	Isthmus 33°	17.15	-30.8	24.80	24.6	19.90	14.53	14.83	17.00
U.S.S.R.	Export blend 32°	16.10	-38.2	26.05	28.6	20.25	14.55	15.80	16.30
Total World		16.05	-35.1	24.72	30.7	18.91	13.58	16.57	16.24
U.S.†		15.20	-100.0	19.58	5.8	18.50	13.80	13.64	13.79

* Represents estimated contract prices based on government stated prices, netback deals and spot market quotations.
† U.S. average crude oil wellhead price.

Source: Energy Information Administration.

cut into gas markets. The effect will be partly offset by declining nuclear output.

U.S. marketed production of natural gas is expected to fall in 1991 by 1.5% to 18.2 tcf as demand holds steady and imports rise. Last year production was boosted by a need to replenish storage, which had been drawn down during the cold spell in December 1989.

Imports of natural gas will increase 3.8% in 1991 to 1.57 tcf. Imports from Canada will move up 4.7% to 1.495 tcf. There will also be a small but steady supply of LNG, which will slip to 75 bcf from 84 bcf in 1990.

Supply

The rebound in Alaskan production temporarily reversed a decline in U.S. crude and condensate production during the first half of 1991. Output averaged 7.42 million b/d vs. the 7.386 million b/d average of the same period a year ago.

Alaskan production was up 57,000 b/d, averaging 1.84 million b/d. Lower 48 output averaged 5.58 million b/d, compared with 5.603 million b/d the first half of 1990.

The decline in U.S. crude and condensate production is expected to continue through

1991 and beyond. North Slope production output is expected to slip in future years. The decline in total U.S. output started in early 1986 and accelerated in 1989 because of the Alaskan Valdez oil spill and in 1990 because of the Alaskan maintenance projects.

Alaskan production was as high as 2.031 million b/d during first half 1988. The completion of the maintenance projects has not reversed the natural decline in Alaska.

U.S. production, resuming its general decline, will average 7.26 million b/d in the second half—1.8 million b/d from Alaska and 5.46 million b/d from the Lower 48. Production in the Lower 48 will continue to slide through the year, dipping to 5.4 million b/d in the fourth quarter.

Increased drilling in 1990, enhanced recovery, and new technology helped slow the U.S. decline rate in 1991, but drilling isn't high enough to reverse the downward trend. The boost in crude oil prices in late 1990 injected some additional funds into the industry but only for a short period.

U.S. production reached a recent peak of 8.971 million b/d in 1985 and averaged 9.108 million b/d during the

first quarter of 1986. Production had been pushed up in the early 1980s due to increased drilling activity and increased North Slope output. Production has been sliding since 1986 due to the sharp decline in drilling and the recent start of a decline in North Slope production.

Alaskan output is expected to average 1.82 million b/d this year, compared with 1.774 million b/d in 1990. The peak was 2.017 million b/d in 1988. Lower 48 output for all of 1991 will dip to 5.52 million b/d from 5.582 million b/d last year.

Production of natural gas liquids and other hydrocarbons averaged 1.74 million b/d in the first half of 1991, up 8.9% from the same period a year before. It will average 1.7 million b/d for the year, up 3.7% from 1990. This will boost U.S. total liquids production to 9.04 million b/d for 1991, an increase of 0.5% from the year before. This is the first year-to-year increase in total liquids output since 1985. However, total production will still be down 15% from the 10.636 million b/d in 1985.

Imports

This year's expected decline in crude and product

imports will be the second in a row.

Last year a drop in domestic consumption and a drawdown of stocks led to a 14,000 b/d reduction in total industry imports. Helping was the emergency drawdown of the Strategic Petroleum Reserve, which contributed 11,000 b/d to supply and continued into the first half of 1991.

In that period, total imports, excluding crude for the SPR, averaged 7.39 million b/d, down 12.7% from 1990. Imports are expected to average 8.030 million b/d in the second half, bringing the average for the year to 7.71 million b/d, down 3.5%. This follows an 0.2% decline in 1990.

The peak year for industry imports was 1977 when the average was 8.786 million b/d. Industry imports dipped to a recent low of 4.949 million b/d in 1985 as a result of an increase in domestic production and a decrease in product demand. Imports moved back up to 8.005 million b/d in 1989 but have retreated in the past 2 years due to weak demand.

This year, crude imports, excluding the SPR, will increase 0.7% to 5.91 million b/d following a 1.4% increase

U.S. imports

Sources of crude imports*

Country	Share of total 1991, %	First quarter average 1991, 1,000 b/d	Change 1991/1990, %	Annual average 1990, 1,000 b/d	Change 1990/1989, %	Annual average 1989, 1,000 b/d
Algeria	1.1	80	- 4.8	63	5.3	60
Indonesia	1.9	101	3.1	96	-37.9	158
Nigeria	10.7	569	-27.4	784	- 2.1	800
Saudi Arabia	30.9	1,639	37.2	1,195	7.1	1,116
Venezuela	12.6	668	0.3	666	34.6	496
Other OPEC	1.7	92	-67.0	706	- 5.3	747
Total OPEC	59.0	3,129	-11.0	3,514	4.1	3,376
Angola	3.9	207	-12.3	236	-15.5	279
Canada	14.8	784	21.9	643	2.0	630
Colombia	2.5	134	- 4.3	140	3.0	136
Mexico	14.0	743	7.8	680	- 3.7	716
Trinidad & Tobago	1.3	71	- 6.6	76	3.4	73
United Kingdom	0.4	20	-87.1	155	- 2.9	160
Other Non-OPEC	4.1	216	-51.0	441	- 6.7	473
Total Imports	100.0	5,304	-10.0	5,894	0.9	5,843

Sources of refined product imports

Algeria	13.6	206	- 5.1	217	4.0	209
Saudi Arabia	4.8	73	-49.3	144	32.8	109
Venezuela	21.4	324	- 9.7	359	- 5.0	378
Other OPEC	1.3	20	-68.3	63	- 8.2	69
Total OPEC	41.1	623	-20.4	783	2.5	764
Brazil	0.9	14	-71.4	49	-40.1	82
Canada	17.2	260	-10.7	291	- 3.4	301
Mexico	1.8	28	-57.6	66	28.7	51
Netherlands	1.1	16	-70.9	55	12.3	49
Romania	0.4	6	-59.0	14	-45.8	26
Virgin Islands	15.4	233	-17.3	282	-12.1	321
Other Non-OPEC	22.2	336	-42.3	583	- 6.5	624
Total Imports	100.0	1,516	-28.6	2,123	- 4.3	2,217

*Includes imports for the Strategic Petroleum Reserve.
Source: Energy Information Administration.

last year. During the first half this year they averaged 5.7 million b/d, down 7.5% from first half 1990.

Crude imports by the government for the SPR will average 25,000 b/d if fill is resumed in the second half. There were no SPR imports in the last 4 months of 1990 and the first 4 months of 1991. SPR imports had averaged about 55,000 b/d prior to the conflict in the Persian Gulf.

Product imports will fall 15.3% to 1.8 million b/d this year. During the first half product imports averaged 1.69 million b/d, down 28% from the first half last year. Increased demand in the second half, particularly for residual fuel oil, is expected to boost product imports to 1.91 million b/d, up 0.4% from last half 1990. With little excess capacity at U.S. refin-

eries upward movement in product demand results in increased product imports.

The leading source of crude imports during the first quarter of this year was Saudi Arabia at 1,639 million b/d, up 37.2% from the first quarter of 1990. Crude imports from Saudi Arabia averaged 1,195 million b/d for all of last year. They were as low as 131,000 b/d in 1985.

Total crude imports from the OPEC countries averaged 3,129 million b/d for the first quarter, down 11% from the same period a year earlier. Crude imports from OPEC moved up 4.1% in 1990 to average 3,514 million b/d for the year. Crude imports from OPEC represented 59% of the total in the first quarter this year. Crude imports from OPEC were only 41% of the total in 1985, averaging 1,312 million b/d.

First quarter product imports were down 28.6% at 1,516 million b/d. Venezuela was the leading source at 324,000 b/d, but this was down 9.7% from a year earlier. Product imports from OPEC averaged 623,000 b/d, down 20.4% from first quarter 1990.

Stocks

Industry stocks have moved up since yearend 1990 but are slightly below year ago levels. At midyear crude stocks were an estimated 350 million bbl, up from 323 million bbl at yearend 1990 but down 8.9% from the 384 million bbl at the end of June 1990.

At the end of the first half of this year product stocks were at 730 million bbl, up from 712 million bbl at yearend 1990 and 714 million bbl at the same time last year.

Product stocks have been boosted in 1990 and 1991 even though product demand has slumped.

Last year the lower crude oil prices during the second quarter encouraged refiners to carry additional inventory to meet the seasonal upswing in demand expected later in the year. When crude prices moved up refiners reduced stocks to minimum operating levels related to demand.

Total industry stocks at yearend 1989 represented only 57.9 days of supply at 1989 demand levels. At yearend 1990 this had risen to 60.9 days of supply at 1990 demand levels. By midyear this year stocks had moved up to 66.3 days of supply at current demand levels. At yearend stocks are projected at 62.3 days of supply.

There have been no SPR crude imports since August 1990. At midyear SPR stocks stood at 568 million bbl, down 3.2% from a year earlier. If SPR imports are resumed at the past rate of 55,000 b/d it is expected that the SPR stocks will move up to 578 million bbl at yearend 1991. This would still be below the peak of 590 million bbl at end September 1990.

Worldwide trends

Absence of significant spare production capacity is a key feature of the 1991 worldwide oil market.

According to latest estimates by the U.S. Central Intelligence Agency, OPEC without Kuwait and Iraq has sustainable production capacity of 22.84 million b/d and available capacity of 23.44 million b/d.

IEA estimated OPEC crude production in the first quarter of 1991, excluding Iraq, averaged 22.9 million b/d—about the sustainable capacity level estimated by CIA.

Demand for OPEC crude isn't expected to exceed capacity estimates until the fourth quarter, when IEA sees it averaging 24 million b/d absent stock change.

Weak worldwide demand during the first half led to weakness in crude prices. According to the U.S. Energy Information Administration

the average price of world export crude oil was \$24.24/bbl the first week of 1991. The average export price for OPEC crude was \$23.86/bbl. By the week of June 14 the average world export price was down to \$16.05/bbl, and the average OPEC export price was down to \$15.81/bbl.

The stated OPEC goal was to stabilize prices for a basket of seven world export crudes at \$18-20/bbl. The average price for these seven crudes was \$25.95/bbl the first week of 1990. It had fallen to \$17.29/bbl by the week of June 22.

With OPEC not wrestling with as much excess capacity as usual, the price outlook depends more on demand in industrial countries and stock management in the Northern Hemisphere winter.

IEA says stocks held by members of the Organisation for Economic Cooperation and Development as of Apr. 1 were 3.358 billion bbl, down 44 million bbl from Jan. 1 and down 29 million bbl from Apr. 1, 1989. Apr. 1 stocks represented 100 days of consumption, compared with 96 days as of Jan. 1.

Industry stocks, however, represent only 70 days of supply vs. 69 days a year earlier. Industry stocks have amounted to 67-70 days of forward consumption for the past 6 years. If refiners choose to work off some of these stocks demand for OPEC oil could be reduced. However, the stock level appears consistent with demand, and withdrawals probably will not be extensive.

According to IEA, first quarter worldwide oil production was down 1.3% from the level a year earlier, averaging 67 million b/d.

OPEC output was 25 million b/d, down from 25.7 million b/d in 1990.

Non-OPEC production fell 200,000 to 42 million b/d. This included a 1.1 million b/d drop in U.S.S.R. output to 10.9 million b/d. Other non-OPEC output gained, largely on the strength of increases in Norway and Mexico.

IEA projects a 100,000 b/d decline in worldwide demand for petroleum products to

65.6 million b/d. This includes a projected 400,000 b/d drop in North American demand and a 500,000 b/d drop in U.S.S.R. demand. The largest increase will be in Asia, up 400,000 b/d. Demand in Western Europe is expected to move up 200,000 b/d.

IEA is projecting a 400,000 b/d drop in non-OPEC supply to 41.3 million b/d. This will mean that an additional 300,000 b/d will have to come from stocks or from OPEC.

With demand constant, stocks probably won't change much in 1991.

This translates into demand for OPEC crude oil and NGL averaging 24.3 million b/d for the year. This is down 700,000 b/d from the IEA estimate of 25.0 million b/d for OPEC output in 1990.

Last year IEA estimates show that 1 million b/d went into inventory. Demand for OPEC oil rose accordingly. Projections for this year assume no stock build and thus no corresponding call on OPEC oil.

Total OPEC liquids output averaged 25.1 million b/d in the first quarter. Total second quarter demand for OPEC oil will be the lowest for the year at 23.1 million b/d.

Demand for OPEC oil will then move up to 23.4 million b/d in the third quarter and 25.9 million b/d in the fourth quarter.

If actual demand for OPEC oil moves up to levels similar to that anticipated by the IEA, crude prices could begin to move up as demand for OPEC oil increases in the third and fourth quarters.

IEA expected recessions in the U.S. and Canada to have ended by midyear, with a second half recovery boosting North American demand in the fourth quarter. If so, crude price increases are likely as refiners search for supplies to meet anticipated winter demand. With limited OPEC excess capacity a surge in demand could result in a sharp spike in prices. However, if crude prices move up too rapidly refiners could choose to reduce stocks and risk running with closer to minimum operating inventories.



Second half work to boost 1991 drilling in the U.S.

G. Alan Petzet
Exploration Editor

U.S. well completions in 1991 will increase about 8% compared with 1990 if operators stick with present spending plans during the second half.

Operators are expected to realize \$76.4 billion in well-head revenues this year, 10.7% less than the 1990 estimate. However, they are expected to invest a larger share of those revenues in drilling this year than they did in 1990.

With less than half the year remaining, here is Oil & Gas Journal's updated look at 1991 U.S. drilling:

- The rotary rig count will average 1,050, up from last year's average of 1,010.

- Operators will drill about 31,654 oil wells, gas wells, and dry holes, compared with an estimated 29,170 drilled in 1990.

- Exploratory drilling will decline to 5,711 wildcats.

- Total footage drilled will

exceed 152 million ft of hole; average well depth is expected to be about 4,805 ft.

- Major oil companies drilled 2,602 wells in the U.S. during first half 1991 and plan to drill 2,569 the rest of this year.

Meanwhile, drilling in western Canada will likely total 5,900 wells this year.

Behind the statistics

The lowest field prices for gas since the onset of decontrol in the late 1970s, a major relaxation in coalbed methane drilling, and a decline in horizontal drilling are affecting U.S. activity this year.

Drilling for coalbed methane is off sharply this year from the flurry of wells drilled during 1990, estimated by one company at 3,600 (OGJ, May 20, p. 32).

That study, by Ammonite Resources, New Canaan, Conn., predicted that a further 4,100 coalbed methane wells will be drilled in the Black Warrior basin, 2,500 in the San Juan basin, 750 in

OGJ's revised drilling forecast for 1991—U.S. and Canada

State, district, province	First half 1991			Full year 1991			
	Total comp.	Wildcats	Total R (1,000)	Total comp.	Wildcats	Field wells	Total R (1,000)
Alabama	127	16	410	267	33	234	863
Alaska	50	3	514	112	6	106	1,151
Arizona	0	0	0	2	1	1	7
Arkansas	79	11	358	140	19	121	635
California Onshore	929	34	2,352	1,898	70	1,828	4,806
California Offshore	18	0	122	25	0	25	170
Colorado	457	114	2,471	955	238	717	5,165
Florida	4	1	48	9	2	7	107
Georgia	0	0	0	1	0	1	0
Illinois	269	109	520	556	225	331	1,075
Indiana	47	13	63	100	27	73	134
Iowa	0	0	0	0	0	0	0
Kansas	1,242	383	4,005	2,500	770	1,730	8,063
Kentucky	592	139	1,205	1,211	283	928	2,464
Louisiana	666	65	5,454	1,360	131	1,229	11,077
Louisiana-North	209	16	952	435	34	401	1,981
Louisiana-South	156	29	1,704	305	56	249	3,331
Louisiana-Offshore	301	20	2,799	620	41	579	5,765
Michigan	555	409	1,525	1,117	823	294	3,068
Mississippi	125	36	1,075	256	74	182	2,201
Missouri	0	0	0	2	0	2	6
Montana	179	15	570	342	29	313	1,089
Nebraska	72	39	362	159	85	74	800
Nevada	17	13	89	39	29	10	203
New Mexico-East	499	54	3,250	1,023	110	913	6,663
New Mexico-West	127	3	467	266	7	259	977
New York	69	3	193	123	5	118	344
North Dakota	111	52	961	225	106	119	1,948
Ohio	508	16	2,057	1,030	32	998	4,170
Oklahoma	2,003	132	10,964	4,075	269	3,806	22,307
Oregon	3	1	7	7	2	5	16
Pennsylvania	532	13	2,250	1,094	27	1,067	4,627
South Dakota	3	0	18	8	1	7	48
Tennessee	38	3	66	82	6	76	143
Texas	5,128	893	27,696	10,491	1,822	8,669	56,795
District 1	517	93	1,898	1,030	184	846	3,782
District 2	198	61	1,197	434	134	300	2,623
District 3	389	130	2,931	805	268	537	6,066
District 4	327	80	2,549	639	156	483	4,981
District 5	101	15	538	240	35	205	1,278
District 6	288	25	2,281	629	55	574	4,982
District 7-B	616	120	1,835	1,245	242	1,003	3,709
District 7-C	512	93	2,867	1,040	188	852	5,823
District 8	755	50	4,526	1,550	102	1,448	9,292
District 8-A	590	89	3,354	1,188	179	1,009	6,753
District 9	630	116	2,172	1,280	236	1,044	4,413
District 10	135	11	906	275	23	252	1,845
Offshore	70	10	642	136	20	116	1,248
Utah	196	62	1,134	425	135	290	2,460
Virginia	29	3	149	65	7	58	335
Washington	0	0	0	1	1	0	6
West Virginia	401	37	1,829	831	76	755	3,790
Wyoming	411	125	2,104	857	260	597	4,387
Total U.S.	15,486	2,797	74,299	31,654	5,711	25,943	152,098
Western Canada	2,883	1,408	11,817	5,900	2,877	3,023	24,142
Alberta	2,253	1,158	9,526	4,550	2,358	2,198	19,237
Saskatchewan	414	148	1,265	890	309	581	2,719
British Columbia	175	92	864	375	197	178	1,851
Manitoba	31	1	97	65	2	63	202
Northwest Territories	10	9	66	20	17	3	132
Eastern offshore	3	3	32	5	2	3	53
Eastern land	29	10	53	65	25	40	120

the Appalachian basin, and 100-400 each in Southeast Kansas and the Raton, Powder River, Green River, and Piceance basins and western Washington during 1992-94.

Horizontal drilling contin-

ues to swell footage figures in the few areas in which it is a significant percentage of all drilling.

For instance, the 710 wells reported as completed in South Texas Dist. 1 during

1990 averaged 6,533 ft in depth. Of those wells, 221 in Frio County averaged 8,035 ft in depth, and 67 in Dimmit County averaged 7,867 ft in depth, Petroleum Information figures showed.

At midyear 1991, the rig count was declining in Dist. 1 as horizontal drilling eased in the Pearsall field area. However, rig counts were rising to the east in Dists. 2 and 3 due to several factors, including

Majors' drilling forecast

State, district, province	—First half completions—			—Second half wells planned—		
	Total wells	Wildcats	Field wells	Total wells	Wildcats	Field wells
Alabama	9	1	8	21	2	19
Alaska	21	2	19	64	10	54
Arkansas	2	2	0	3	3	0
California Land	1,326	10	1,316	2,168	25	2,143
California Offshore	3	0	3	8	0	8
Colorado	26	11	15	85	28	57
Illinois	0	0	0	36	0	36
Kansas	191	6	185	242	8	234
Kentucky	0	0	0	2	2	0
Louisiana	188	50	138	405	105	300
Louisiana-North	5	0	5	11	0	11
Louisiana-South	47	13	34	120	35	85
Louisiana-Offshore	136	37	99	274	70	204
Michigan	4	2	2	17	5	12
Mississippi	15	2	13	22	6	16
Montana	17	4	13	34	4	30
Nevada	1	0	1	2	1	1
New Mexico—East	77	3	74	150	4	155
New Mexico—West	10	5	5	31	10	21
North Dakota	5	1	4	24	6	18
Ohio	2	2	0	2	2	0
Oklahoma	75	4	66	199	27	172
Pennsylvania	9	0	9	54	0	54
Tennessee	0	0	0	1	1	0
Texas	553	38	515	1,342	105	1,237
Dist. 1	10	0	10	31	12	19
Dist. 2	11	2	9	25	2	23
Dist. 3	36	2	34	98	12	86
Dist. 4	56	6	50	153	18	135
Dist. 5	5	2	3	15	6	9
Dist. 6	46	4	42	192	4	188
Dist. 7-A	1	0	1	6	0	6
Dist. 7-C	10	1	9	20	5	15
Dist. 8	164	1	163	296	5	291
Dist. 8-A	167	0	167	411	4	407
Dist. 9	4	1	3	4	1	3
Dist. 10	18	4	14	49	10	39
Offshore	25	15	10	42	26	16
Utah	11	4	7	25	10	15
Virginia	0	0	0	66	0	0
West Virginia	7	0	7	15	0	15
Wyoming	50	2	48	144	5	139
Total U.S.	2,802	184	2,448	5,171	369	4,802
Western Canada	254	70	184	426	159	267
Alberta	217	48	169	325	126	199
Saskatchewan	7	1	6	28	0	28
British Columbia	0	0	0	17	0	17
Manitoba	27	18	9	54	31	23
Northwest Territories	3	3	0	2	2	0
Eastern offshore	0	0	0	1	1	0

the eastward movement of horizontal drilling to Upper Cretaceous Austin chalk.

Where it's happening

Drilling is expected to pick up somewhat during second half 1991 as several companies have increased spending plans late in the first half.

OGJ estimates that 16,168 wells will be drilled in the second half, up from 15,486 wells in the first half.

New Mexico and Alabama are returning to more historic drilling levels after last year's booms in coalbed methane drilling. Operators are completing and connecting hundreds of coal gas wells in those areas this year.

Drilling to Cambrian and Ordovician zones is still building in Alabama north through many of the Appalachian states.

Operators are likely to drill more than 4,000 wells in Oklahoma and 2,500 in Kansas this year.

No relief is expected from historically low drilling levels in Pennsylvania, where OGJ expects 1,094 wells to be drilled this year.

The Pennsylvania Geological Survey said records for 1,174 wells were submitted during 1990, a 23% drop from 1989 and the smallest number of new wells drilled in the state since 1,156 in 1973.

Exploratory drilling is expected to pick up in eastern Utah.

Leasing has been brisk around a horizontal oil discovery Columbia Gas Development Corp. completed in northern San Juan County, and proposed new gas pipelines are stimulating drilling in Uintah and Grand counties.

Survey of majors

The major oil companies that responded to OGJ's mid-year drilling survey will drill most of their 1991 wells in West Texas and the California heavy oil fields, but several other interesting signs are evident in the responses.

Healthy increases are planned in East Texas and the Texas Gulf Coast, some of them driven by tight sands gas and horizontal oil drilling.

The responses also show the majors will drill more

Drilling activity languishes outside the U.S., Canada

The active rig count outside the U.S., Canada, and formerly Communist countries is languishing despite many companies' decisions to spend more on exploration overseas and less in the U.S.

Baker Hughes Inc.'s international rig count has averaged 893 so far this year, compared with 923 in 1989 and 906 in 1990.

The count averaged 927 during January through May 1990 and 965 in the first 5 months of 1989. The count has been unable to repeat the strong start logged in early 1989.

The non-Communist active rig count outside North America last topped 1,000 in February 1989 with a monthly average of 1,008. Since then it has hit low points of 854 in September 1990 and 857 in February 1991 and has been no higher than March 1989's 983.

The count is up slightly from early 1991. It climbed to 911 in March and 927 in April then sagged to 905 in May. It averaged 868 in January and 857 in February. The May figure compared with 937 in May 1990.

Here's how certain countries and continents have fared in drilling:

Latin America

The count showed 261 rigs active in May 1991, up 5.7% from May 1990.

Mexico had 106 rigs active compared with only 87 in May 1990, and Venezuela's count was 43, up from 29.

Ecuador had eight rigs active compared with only two a year earlier.

Argentina had 53, down 27% on the year. Brazil's 23 active rigs were one fewer than in May 1990.

Europe

Europe had 177 active rigs, up slightly from 168 in May 1990.

Norway had 20 rigs active compared with 12 a year earlier, and the U.K. had 45, up one.

Baker Hughes began counting Poland, which had 35 active rigs each in March and April 1991 and 25 in May. Newly counted Hungary had six rigs in each of the 3 months.

Yugoslavia had only 14 compared with 36 in May 1990, and Holland had nine, down from 17.

Africa

Africa also posted a small gain to 93 from 90, with Nigeria and Tunisia setting the pace.

During May Algeria had 30 active rigs, down five on the year; Nigeria 23, up five; and Libya 15, unchanged.

Middle East

The survey showed 112 rigs active in the region, down 26% from May 1990.

No entry is being made for Iraq or Kuwait. Iraq had 38 rigs active and Kuwait 5 in August 1990, the month Iraq invaded Kuwait last August.

Saudi Arabia had 15 rigs running, up from 11, but Syria had only 12, down from 19. Iran had 22, up two.

Far East

The count in May was 262, down from 280 on the year.

India was holding nearly steady with 138 rigs active, down two. Indonesia had 49, down five. Myanmar had 20, down one.

Brunel had seven, up from four, and the Philippines had seven, up two.

Australia was unchanged at 12 rigs active.

wells in the second half than in the first half in several Rocky Mountain states, including North Dakota, Colorado, Utah, and Wyoming.

The majors plan 85 wells, including 28 wildcats, in Colorado for the full year. The state has exploration under way in practically every basin.

The majors said they drilled only 26 wells in the state in the first half.

Drilling offshore and in South Louisiana is poised for a good increase in second half 1991.

Kansas activity by the majors will slow after a strong first half, led by continued infill drilling in Hugoton gas field.

The majors plan three more wildcats in Arkansas in the second half.

Canadian outlook

OGJ estimates operators will drill 4,550 wells in Alberta, 890 in Saskatchewan, and 375 in British Columbia this year.

Light oil drilling has increased in recent months in western Canada, and gas drilling there has waned because of low gas prices.

Canadian gas producers received several encouraging signs during first half 1991 that gas drilling may strengthen during the mid-1990s.

A study prepared for NCE Resources Group took the view that Canadian gas prices at the wellhead might double by 1995 because of falling U.S. supply and increased demand.

The study indicated that the average wellhead price in the U.S. will rise 15%/year in real terms between 1989 and 1995.

That would boost Canadian prices to \$3-3.50/Mcf in 1986 dollars by 1995.

An Alberta trade delegation learned that Mexico will not likely compete with Canadian producers for gas sales to the U.S. in the near future.

The delegation said it found that Mexico hopes to import gas for its northern Chihuahua state from Texas in the short term. Mexico is unable to supply that area adequately from its own reserves.

Survey shows over 1,000 refining catalysts

Anne K. Rhodes
Refining/petrochemical editor

The Journal's latest survey of worldwide refining catalysts reveals that there are more than 1,040 unique catalyst designations in commercial use in 19 processing categories—an increase of some 140 since the compilation of refining catalysts was last published (OGJ, Oct. 2, 1989, p. 49).

As a matter of interest, some 700 catalysts were determined during the first survey (OGJ, Oct. 8, 1984, p. 55).

The processing categories surveyed are: Catalytic naphtha reforming, Dimerization, Isomerization (C₄), Isomerization (C₅ and C₆), Isomerization (xylenes), Fluid catalytic cracking (FCC), Hydrocracking, Mild hydrocracking, Hydrotreating/hydrogenation/saturation, Hydrorefining, Polymerization, Sulfur (elemental) recovery, Steam hydrocarbon reforming, Sweetening, Claus unit tail gas treatment, Oxygenates, Combustion promoters (FCC), Sulfur oxides reduction (FCC), and Other refining processes.

Although the total number of listed catalysts increased this year, the number of catalysts in the major categories (such as FCC, hydrotreating/hydrogenation/saturation, hydrorefining, and catalytic naphtha reforming) has stabilized (Table 1).

Factors contributing to the increase in catalysts are new catalysts, some industry acquisitions, and the addition of six suppliers to the list, who contributed 73 new catalysts.

The total number of catalyst designations is not simply a count of those listed in the survey. One reason is that, in some cases, more than one supplier offers the

same catalyst and these designations are therefore repeated.

Another is that some manufacturers have listed the same catalyst for different applications; most importantly in hydroprocessing. Some manufacturers do not differentiate between hydrotreating and hydrorefining, although the survey does make that distinction.

Both these preceding reasons were considered and, where known, catalysts were not counted multiple times in figuring the total. However, in figuring the subtotals by category, catalysts with dual applications were counted in each category.

Scope, purpose

OGJ's "International refining catalyst compilation" lists catalysts from essentially all of the world's manufacturers and suppliers, for practically all refinery catalytic processes.

The first objective of the compilation is to list all catalysts by their specific designations (supplier's identifications) in their specific area of

process application; for instance fluid catalytic cracking.

The second objective is to differentiate, in some way, each catalyst from another in the same category in order to explain why two catalysts used for the same process have different designations.

In the ideal case, for example, two similar hydrotreating catalysts will have different designations to indicate their differing abilities to produce identical product quality from feedstocks that differ in sulfur or metals content.

However, in many cases there can be a number of different designations denoting differences in physical characteristics such as particle size or pore volume.

Many catalysts, particularly in FCC and hydroprocessing, appear in "families." Survey respondents were asked to point out the difference of the lead family member in terms of their other families, if they have more than one.

Within a family, respondents were asked to point out the differences in a catalyst in terms of the other members



of that single family. Examples of such differences include particle size and activity.

The information supplied is the suppliers' best efforts to meet the objectives of the compilation. Blanks throughout the compilation reflect, in most cases, the lack of supplier response.

The symbol "P" appears occasionally to signify some proprietary aspect of a catalyst that the supplier chooses not to divulge.

The manufacturers were asked to list all commercial catalysts that are available by sale or license to refiners. Those available for unrestricted sale are denoted by an "x" in the far right column of the table. Those that are available only through process licensing arrangements are denoted by an "L" in the same column.

Liberal use of abbreviations is made in the compilation in order to fit as much information as possible into limited space. Most of the commonly used abbreviations are listed in the accompanying table.

The compilation is designed to provide a ready reference for both refiners and manufacturers and to sort out the sometimes-confusing no-

Table 1
Change in catalyst category totals since 1989

Category	1989	1991
Catalytic naphtha reforming	70	75
Dimerization	2	2
Isomerization (C ₄)	4	4
Isomerization (C ₅ and C ₆)	8	7
Isomerization (xylenes)	3	12
Fluid catalytic cracking	229	214
Hydrocracking	68	68
Mild hydrocracking	40	39
Hydrotreating/hydrogenation/saturation	158	154
Hydrorefining	122	176
Polymerization	8	7
Sulfur (elemental) recovery	35	43
Steam hydrocarbon reforming	95	112
Sweetening	14	11
Claus unit tail gas treatment	32	35
Oxygenates	1	3
Combustion promoters (FCC)	27	27
Sulfur oxides reduction (FCC)	7	9
Other refining processes	70	73

menclature used to designate or label catalysts.

Industry activity

Several factors have produced changes in the list of companies included in this year's compilation.

1. Acquisitions:

- Crosfield Catalysts' acquisition of ICI Katalco's hydrotreating business.

- United Catalysts Inc.'s acquisition of Air Products & Chemicals Inc.'s Houdry hydrotreating catalyst, HR 836.

- Procatalse has taken over Rhone-Poulenc's specialized and alumina molecular sieve activities.

2. Name changes:

- Kali-Chemie is now Solvay Catalysts.

- Arco Lyondell Licensing Inc. is now Lyondell Licensing Inc.

3. Producers/suppliers new to this year's survey:

- Leuna-Werke AG, Leuna, Germany

- Orient Catalysts, Tokyo

- Mobil Chemical International Ltd., Princeton, N.J.

- Shell International Chemical Co. Ltd., London.

- Discovery Chemicals Inc., Port Allen, La.

- Institute of Catalysis, Novosibirsk, U.S.S.R.

Survey results

The total number of FCC catalyst listings has decreased slightly (Table 1). The consolidation of 1989's Akzo Chemicals Inc. and Filtritol Corp. entries was largely responsible for the overall reduction in FCC catalyst designations. Akzo has added three new series of FCC catalysts to its line. Crosfield Catalysts and Davison Chemical Division have both added to their FCC catalyst lines.

Engelhard Corp. has streamlined its listing of FCC catalysts, adding two series, reducing the size of most series, and reducing some series to single listings.

Katalistiks International Inc. has added two series and expanded most of its remaining ones.

UOP and Unocal Corp. have consolidated their hydrocracking catalysts, under the name UOP/Unocal, and shortened their listing slightly.

Zeolyst Enterprises has added four catalysts to its hydrocracking group, and Chevron Research & Technology Co. has added three.

These and other changes, including the addition of two Mobil Chemical International Ltd. catalysts, have combined to lengthen the list of hydrocracking catalysts by one entry. (This calculation counts the two Shell International Chemical Co. Ltd. catalysts—S-703 and S-753—as being identical to Zeolyst Enterprises' Z-703 and Z-753.)

Several additions and deletions in the mild hydrocracking category resulted in a net change of one less catalyst in this year's compilation.

Changes in the hydrotreating/hydrogenation saturation category reduced the total by 4. In one large change, Criterion cut its listings in this category by 13 when it reduced the Trilobe HDS and HDN series.

This year's largest change is Akzo's addition of 47 catalysts to its Hydrorefining list. (Most of these catalysts are not new products—they had

previously been listed in the Hydrotreating/hydrogenation/saturation category, as they are again this year.)

This, accompanied by the addition and deletion of other hydrorefining catalysts, produced a net increase of 54 catalysts in this category.

One manufacturer has suggested combining hydrorefining and hydrotreating into a single category for the next compilation and adding "residue hydroprocessing" as a separate category. Akzo, for example, says some of its catalysts are used for a wide range of operations, from naphtha pretreating up to mild hydrocracking or resid hydroconversion.

The categories showing the largest increase over the last survey's totals are: Steam reforming (+17), Xylene isomerization (+9), Sulfur (elemental) recovery (+8), and Naphtha reforming (+5).

Instituto Mexicano del Petroleo and BP America Inc. did not respond to the survey. Their listings from the previous compilation were included in this year's Table. •

Abbreviations for catalyst compilation

ABD—Apparent bulk density

AGO—Atmospheric gas oil

ARO—Aromatic or aromatics

BTX—Benzene, toluene, xylenes (aromatics)

Cet.—Cetane

CGO—Coker gas oil

Cyl.—Cylinder

DAO—Deasphalted oil

Dist.—Distillate or distillates

DMO—Demetallized oil

DO—Diesel oil

Ext.—Extrudate

FCC—Fluid catalytic cracking or FCC unit

GO—Gas oil

Gasol.—Gasoline

HAGO—Heavy atmospheric gas oil

HC—Hydrocracking or hydrocracked

HCO—Heavy cycle oil

HDM—Hydrodemetallization

HDN—Hydrodenitrogenation

HDS—Hydrodesulfurization

HDT—Hydrotreating or hydrotreated

HFO—Heavy fuel oil

HGO—Heavy gas oil

HSFO—High sulfur fuel oil

HVGO—Heavy vacuum gas oil

Jet.—Jet fuel

Kero.—Kerosine

LCO—Light cycle oil

LGO—Light gas oil

LSFO—Low sulfur fuel oil

LSR—Light straight run

MHC—Mild hydrocracking

MS—Microsphere

Oct.—Octane

"P"—Proprietary

Prom.—Promoted or promoter

RE—Rare earth

RDS—Residual desulfurization

SA—Surface area

SR—Straight run

Stab.—Stable or stability

Sph.—Sphere

Sh. ext.—Shaped extrudate

VGO—Vacuum gas oil

Zeo.—Zeolite

x—Unrestricted availability

L—Available under license only

OGJ international refining-catalyst compilation—1991

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
Catalytic naphtha reforming catalysts								
AKZO CHEMICALS INTERNATIONAL BV								
CK-300 Series	All monometallics, diff. active metal contents	Naphtha	Gas. or BTX	Cyl.	40	Al ₂ O ₃	PtCl	x
CK-433	Bimetallic	Naphtha	"	"	44	"	Pt/ReCl	x
CK-522 TRILOBE	Bimetallic, high part. dens.	Naphtha	"	Sh. ext.	44	"	"	x
CK-542 TRILOBE	High Re, high part. dens. shaped catalyst	Low-sulfur naphtha	"	"	45	"	"	x
ARC-555	Bimetallic/economic	Naphtha	"	Cyl./Sh.	44	"	Pt/ReCl	x
KX-120, 130, 160	(See Exxon Research & Engineering catalytic reforming listing)							L
CHEVRON RESEARCH & TECHNOLOGY CO.								
Rheniforming Type F	Latest version, long-cycle life, stable product yields	Naphthas, SR & cracked-coal naphthas	Gas. & BTX	Cyl.	35	"P"	Pt/Re	L
Type K	Used with Type F for higher severity operations			"	"	"	"	Contact Chevron
CRITERION CATALYST CO. LP								
AEROFORM PHF-5	Monometallic	Naphtha	Gas. or BTX	Cyl.	42	Al ₂ O ₃	"P"	L
PRHF-30	Bimetallic, different amounts of active metals	Naphtha	Gas. or BTX	Cyl.	"P"	"	"P"	L
PRHF-37								
PRHF-50								
PRHF-58								
KX-120, 130, 160	(See Exxon Research & Engineering listings)							
AEROFORM PHF-4	Monometallic	Naphtha	Gas. or BTX	Cyl.	42	Al ₂ O ₃	PtCl	x
TRILOBE P-8	Monometallic	Naphtha	"	Sh. ext.	44	"	"	x
AEROFORM PR-6 & 6A	Bimetallic	Naphtha	"	Cyl.	42	"	Pt/ReCl	x
TRILOBE PR-8, 8A & 8E	Bimetallic	Naphtha	"	Sh. ext.	44	"	"	x
TRILOBE PR-18 & 18A	Bimetallic	Low sulfur naphtha	"	"	44	"	"	x
IMP-RNA-2 (See Instituto Mexicano del Petroleo listing)								
PS-7	Multimetallic	Naphtha	Gas. or BTX	Cyl. or sh. ext.	44	Al ₂ O ₃	PtSnCl	x
PS-10	Multimetallic	Naphtha	Gas. or BTX	Sph.	35	Al ₂ O ₃	PtSnCl	x
ENGELHARD CORP.								
E-301	Moderate stability	Naphthas, S < .5 ppmw	Gas. or Aro.	Cyl.	45	Al ₂ O ₃	Pt	x
E-302	More stable than E-301	Naphthas, S < .10 ppmw	"	"	45	"	"	x
E-311	Maximize LPG production	Naphthas, S < .5 ppmw	LPG gas.	"	45	"	"	x
E-601	High stability	Naphthas, S < .1 ppmw	Gas. or Aro.	"	45	"	Rt, Re	x
E-603	High stab. lower metal load	Naphtha, S < .1 ppmw	"	"	45	"	"	x
E-611	Very high stability	Naphtha, S = 0.1 ppmw	"	"	45	"	"	x
(Note: Preceding catalysts available in higher density at 49.5 lb/cu ft. They are designated HD, i.e. E-301HD)								
E-801	Stab. of E-603 at higher act.	Naphtha, S < .1 ppmw	Gas. or Aro.	Cyl.	51	Al ₂ O ₃	Pt/Re	x
E-802	Stab. of E-611 at higher act.	Naphtha, S < .05 ppmw	"	"	51	"	"	x
E-803	Stab. of E-611 at higher act. opt. metals loading	"	"	"	51	"	"	x
E-804	Stab. & act. of E-801, opt. metals loading	"	"	"	51	"	"	x
EXXON RESEARCH & ENGINEERING CO.								
KX-120	Multimetallic semiregen. or cyclic units, diff. promotor	Virgin/cracked naphthas	High oct. gas. & aro.				Pt, etc.	L
KX-130	"	"	"					
KX-160	"	"	"					
INSTITUTO MEXICANO DEL PETROLEO								
IMP-RNA-1	High activity bimetallic	Desulfurized naphtha, aro. production	BTX, high-oct. gas.	Cyl. ext.	0.70"	Al ₂ O ₃	Pt/Re	L
IMP-RNA-2	"	"	"	Trilobe ext.	0.70"	"	"	L
IMP-RNA-4, continuous process	"	"	High-oct. gas.	Sph.	0.57"	"	Pt/Sn	L
KATALYSATORENWERKE HÜLS GmbH								
H-2440		Fraction 35-195° C.	Gas. or BTX	Cyl. ext.	0.8"	Al ₂ O ₃	Pt, 0.3-0.8% monometallic	x
LEUNA-WERKE AG								
8815/03	Monometallic, different amounts of active metal	Naphtha	Gas. or BTX	Ext.	0.58"	Al ₂ O ₃	Pt	x
8815/05	"	"	"	"	0.58"	"	"	x
8819	All bimetallics, different amounts of active metal	Naphtha, S < 1 ppm	"	"	0.55"	"	Pt/Re Cl	x
8819 WS	"	"	"	Vortex	0.58"	"	"	x

Catalytic naphtha reforming catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
8821	"	"	"	Sph.	0.58*	"	"	x
8822	"	Naphtha, S < 0.5 ppm	"	Vortex	0.55*	"	"	x
8823	"	"	"	Sph.	0.70*	"	"	x
8840	Cont. regen. reformer, high mechanical stability	Naphtha, S < 1 ppm	BTX	Sph.	0.65*	"	Pt + prom.	L
8860	Select. HC of n-paraffins	Naphtha	Gasol.	Vortex	0.45*	Al ₂ O ₃ /zeo.	Pt	x
PROCATALYSE								
RG-412	H.P. reformer	Naphtha	Gasol.	Cyl.	0.6*	Al ₂ O ₃	Pt 0.35%	x
RG-482	M.P. & L.P. reformer	"	Gasol.	"	"	"	Pt 0.3% + Re	x
RG-492	"	"	Gasol.	"	"	"	Pt/Re	x
RG-442	Reformer	"	Gasol. & LPG	"	"	"	Pt + IR + promoter	x
CR-201	Cont. regen. reformer	"	Gasol.	Sph.	"	"	PtSn	L
AR-403	Cont. regen. reformer (IFP aromizing)	"	Aro.	"	"	"	"	L
AR-405	CCR (IFP aromizing)	"	"	"	"	"	"	x
MD-101	Sulfur removal	"	Naphtha	"	"	"	"	x
UOP								
R-11	Higher act. monometallic	Semi-regen. or swing	Gasol. aro.	Sph.	32	Al ₂ O ₃	Pt	Contact UOP
R-12	Monometallic, higher stab. than R-11	Semi-regen.	"	"	32	"	"	"
R-55	Monometallic, higher stab. than R-12	Semi-regen. or swing	"	Ext.	Dense-loaded 52	"	"	"
R-15	Monometallic	Semi-regen.	LPG, gasol.	Sph.	32	SiO ₂ /Al ₂ O ₃	"	"
R-16H	Bimetallic, higher stab. than monometallics	High severity, semi-regen.	Gasol. aro.	"	32	Al ₂ O ₃	Pt/Re	"
R-16F	Bimetallic, low Pt, higher stab. than monometallics	"	"	"	32	"	"	"
R-16G	Bimetallic, higher act. & stab. than R-16F & H	"	"	"	32	"	"	"
R-18	Bimetallic, higher act. & stab. than R-16 series	"	"	"	37	"	"	"
R-22	Bimetallic, higher yields, reduced state	CCR or semi-regen.	Higher pro. of oct. bbl. & aro.	"	32	"	"P"	"
R-30	"	CCR or swing	"	"	35	"	"P"	"
R-32	"	CCR	"	"	"	"	"P"	"
R-34	"	"	"	"	"	"	P	"
R-50	Bimetallic, higher act. & stab. than R-16 series	High severity, semi-regen.	Gasol. or aro.	Ext.	Dense-loaded 52	"	Pt/Re	"
R-51	"	"	"	"	43	"	"	"
R-56	"	"	"	"	Dense-loaded 52	"	"	"
R-60	Bimetallic, higher stab. than R-50, high act.	"	"	Sph.	45	"	"	"
R-62	Bimetallic, lower Pt than R-60, higher stab. than R-50, high act.	"	"	"	44	"	"	"

Dimerization catalysts

PROCATALYSE								
LC 1252		Propylene/butylene	Gasol., hexenes, octenes	Liquid			Ni	L
SOLVAY CATALYSTS GmbH								
Beadcat PK Series	Mechanical and thermal stab.	C ₃ /C ₄ olefins	Gasol.	Bead	0.80*	SiO ₂ /Al ₂ O ₃	Acid sites Al ₂ O ₃	x

Isomerization (C₄) catalysts

BP								
BP Isom	High activity, regenerable			Cyl.		Al ₂ O ₃	PtCl	L
ENGELHARD CORP.								
RD-291	Regenerable, high act.	C ₃ , C ₄	Dimersol, alkyl feed	Cyl.	48	Al ₂ O ₃	PtCl	L
HPN-IVB	Select. hydrog. trace butadiene, isom. butene to butene-2			Sph.	47	"P"	"P"	L
UOP								
I-8	Higher activity for n-butane isom. to iso-butane			Ext.	48	Al ₂ O ₃	Pt	Contact UOP

Isomerization (C₅ & C₆) catalysts

BP								
BP Isom	High act., L.P. operation, regenerable	C ₅ , C ₆ fractions		Cyl.		Al ₂ O ₃	PtCl	L
CHEVRON RESEARCH & TECHNOLOGY CO.								
AROMAX	High-selectivity benzene production	Mixed hexanes	Benzene	Cyl.	46	"P"	"P"	Contact Chevron
ENGELHARD CORP.								
RD-291	Regenerable, high activity	C ₅ , C ₆ paraffins		Cyl.	48	Al ₂ O ₃	PtCl	L

Isomerization (C₅ & C₆) catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
PROCATALYSE IS-632	Nonchlorinated, high act.	C ₅ /C ₆ paraffins	High oct. gaso. or isomers	Ext.	0.50*	Special	Pt	x
UOP I-7	High act., sulfur & water tolerant	SR or HDT C ₅ /C ₆ streams		Ext.	36	"P"	Pt	Contact UOP
I-8	High act., L.P. application				48	Al ₂ O ₃	"	"
HS-10	Non-chloride activated, high tolerance for feed impurities	C ₅ /C ₆ isom.	Octane upgrade	Cyl.	46	Mol sieve Al ₂ O ₃	"	L

Isomerization (xylenes) catalysts

ENGELHARD CORP.								
O-750	Xylene isom.	C ₈ aromatics	p, o-xylene	Cyl.	"P"	"P"	Pt	L
LEUNA-WERKE AG								
8831	Xylene isom., ARIS process	Xylenes, ethylbenzene	p, o-xylene	Vortex Ext.	0.60* 0.70*	Al ₂ O ₃ /zeo. Zeolite	Pt	L
8835								L
MOBIL CHEMICAL INTERNATIONAL LTD.								
MHAI	High activity	Aro., non-aro.	Benzene p, o-xylene	Cyl.	33	"P"	ZSM-5	L
MHTI	High temperature	Aro., non-aro.	Benzene p, o-xylene	"	"	"P"	"	L
MLPI	No H ₂ , low pressure	Aro.	Benzene p, o-xylene	"	"	"P"	"	L
MVPI	Low aging, no ring loss	Aro.	Benzene p, o-xylene	"	"	"P"	"	L
PROCATALYSE								
IS 652	Xylenes isomerization	Mixed xylenes, ethylbenzene	p, o-xylene	Ext.	0.6*	Special	Pt	x
SOLVAY CATALYSTS GmbH								
Beadcat PK series	Xylenes isom.	Xylenes	p, o-xylene	Bead	0.80*	SiO ₂ /Al ₂ O ₃	Acid sites	x
UOP								
I-9	High act. & high select.	Mixed xylenes, ethylbenzene	p, o-xylene	Sph	37	"P"	"P"	Contact UOP
I-100	"	"	p-xylene, benzene	Ext.	34	"P"	"P"	"P"
SHELL INTERNATIONAL CHEMICAL CO. LTD.								
S-771	Xylenes isom.	Mixed xylenes, ethylbenzene	p, o-xylene	Ext.	0.65*	"P"	Pt	Contact Criterion

Fluid catalytic cracking catalysts

AKZO CHEMICALS INC.								
Access	Max. conversion, max. stability, max. throughput	High-nitrogen feeds, resids	Max. liquid yields, max. bottoms upgrading, max. metals tolerance, max. nitrogen tolerance, min. dry gas	MS	0.70*	Active matrix	Zeolite alumina, si	x
Action	Max. octane, Excellent gasoline selectivity	"	Max. octane, max. lt. olefin, max. bottoms upgrading, min. dry gas	"	"	"	"	x
Advance	Max. conversion without octane loss	Gas oil, resids	Max. gaso., min. coke, min. dry gas	"	0.75*	"	"	x
Horizon	Max. product value with heavy feeds	High-nitrogen feeds, resids	Max. octane bbl, max. bottoms upgrading, high conversion, min. dry gas	"	0.70*	"	"	x
Octavision 500 series	Max. product value in octane bbl mode	Gas oil, light resids	Max. octane bbl, high branching of lt. olefins, min. coke & gas	"	0.75*	"	"	x
Octavision 600 series	Premium octane, max. MON	"	Max. octane, max. lt. branched olefins, min. coke & gas	"	0.73*	"	"	x
Eclipse	Max. isobutylene, max. branched amylene	"	Max. IC ₄ = & IC ₅ = selectivity, max. octane, max. bottoms upgrading, min. dry gas	"	0.70*	"	"	x

Fluid catalytic cracking—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
Octabooost 600 series	Max. MON, high branching.	-	Max. MON, high branching low coke & gas	-	0.75*	-	-	x
FOC	Max. throughput with heavy resids	Heavy resids, contaminated feeds	Max. octane bbl, max. metal tolerance, max. bottoms upgrading, min. dry gas, min. delta coke	-	0.70*	-	-	x
Vision	Max. octane bbl and MON	Gas oil, light resids	Max. octane bbl and MON	-	0.75*	-	-	x
Vision L	Max. octane bbl and MON	Heavy resids	Min. delta coke in resid operation	-	0.7*	Special matrix	-	x
Vision MR	Max. octane bbl and MON	-	Max. metal resistance* in resid operation	-	0.75*	-	-	x
CATALYSTS & CHEMICALS INDUSTRIES CO. LTD.								
MRZ-200 MRZ-230 MRZ-240	High liquid yield	Gas oil/resids	High gaso. yield & high LCO, excellent bottoms upgrading	MS	0.72	Silica/Alumina	Fully re-exchanged zeolite, alumina matrix	
MRZ-204 MRZ-206 MRZ-208	High octane	-	Max. oct. and olefins,** bottoms upgrading	-	0.70*	-	Ultrastable zeolite, non-RE alumina matrix	
MRZ-204S MRZ-206S MRZ-208S	High-oct. gasoline, low gas and coke make	-	Maximizes oct. bbl production, high hydrothermal stab. & metals tolerance	-	0.70*	-	Ultrastable zeolite, low RE, alumina matrix	
HYLIC-30 HYLIC-40 HYLIC-50	High gasoline + LCO yield	-	Maximizes liquid yield, high bottoms upgrading	-	0.72*	-	Ultrastable zeolite, moderate RE, moderate matrix activity	x
PCZ-550S PCZ-560S PCZ-570S PCZ-580S	High-oct. gasoline, low gas and coke make	-	Maximizes oct. bbl production, high MON, excellent low coke and gas	-	0.70*	-	Dealuminated ultra-stable zeolite, low RE, low alumina matrix	
ELZ-2050S ELZ-2060S ELZ-2070S ELZ-2080S	High-oct. gasoline, high LCO yields, low gas and coke make	-	Maximizes oct. bbl production, high LCO yields and MON gaso., high hydrothermal stability and metal tolerance	-	-	-	Dealuminated ultrastable zeolite, low RE alumina matrix	
ELZ-2250S ELZ-2260S ELZ-2270S ELZ-2280S	-	Resids	Maximizes oct. bbl production, high LCO yields and MON gaso., high hydrothermal stab and excellent V tolerance	-	-	-	Dealuminated ultrastable zeolite, low RE, V-trap, aluminum matrix	
HARMOREX-1240 HARMOREX-1250 HARMOREX-1260 HARMOREX-1270	High oct. gasoline, excellent low gas and coke make	Gas oil/resids	Superior gaso. yields,* excellent low gas and coke make, high V/Ni tolerance	-	-	-	Dealuminated ultrastable zeolite V/Ni trap	
HARMOREX-2440 HARMOREX-2450 HARMOREX-2460 HARMOREX-2470	-	Resids	Superior gaso. yields,* excellent low gas and coke make, excellent V/Ni tolerance, high bottoms upgrading	-	-	-	Dealuminated ultra-stable zeolite, V/Ni trap, alumina matrix	
CROSFIELD CATALYSTS								
XL Series	Bot. crack. & high gaso. and oct. selectivity	Gas oils	Bot. upgrade, high liq. product oct. and cet.	MS	-	SiO ₂ /Al ₂ O ₃	Zeolite matrix	x
XL 80	-	-	Low act.	-	0.87*	-	-	x
XL 90	-	-	Medium act.	-	0.86*	-	-	x
XL 100	-	-	High act.	-	0.84*	-	-	x
SLS-60 SLS-80 SLS-100	Coke select., gaso. mid. dist. oct., max. oct. bbl	-	Max. gaso. oct. bbl, selective bot. cracking	-	0.78* ABD 0.76* 0.76*	-	-	x x x
SLS Extra series SLS 60 Extra SLS 80 Extra SLS 100 Extra	High oct. gaso. liq. product Low act. Med. act. High act.	Gas oils, resids	Gaso., LCO, - - -	- - - -	0.76* 0.75* 0.74* 0.72*	- - - Zeolite CMT	- - - -	- x x x
GLS Series	Coke select., gaso. mid. dist. oct., max. oct. bbl	Gas oils	Max. gaso. oct. bbl, selective bot. crack.	-	-	-	-	
Quantum Series	Max. oct., low coke, gas select.	Gas oils, resids	Oct., oct. bbl	-	-	SiO ₂ /Al ₂ O ₃	Zeolite CMT	x
Quantum 80	Oct. bbl, low coke/gas select.	-	Med. activity	-	0.74*	-	-	x
Quantum 100	-	-	High act.	-	0.72*	-	-	x
Quantum 2000	Max. oct., oct. bbl min.	-	-	-	0.74*	-	-	x

Fluid catalytic cracking—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
QUASAR 2000 series	High activity/stab. low coke/gas selectivities.	Gas oils	Max. oct.	"	0.74*	"	CCS 64	x
Quasar 3000 series	(Lower series denotes oct., higher series, oct. bbl.)	"	Max. oct. bbl.	"	0.75*	"	"	x
Quasar 4000 series	Bottoms upgrading	"	Max. liq. yield	"	0.76*	"	"	x
QUASER XX7X		"	"	"	"	"	"	x
Vanadium trap (VT), Fluidization additive (CFA), and combustion promoter (CP) can be added to all catalysts								
DAVISON CHEMICAL DIVISION, W. R. GRACE & CO. (Each catalyst group arranged in decreasing order of activity)								
ASTRA-180	High act. w/ oct. bbl yield optimized, dual zeo. system	All types	Max. oct. bbl	MS	0.77*	SiO ₂ /Al ₂ O ₃	Z-14G-US/REHY	x
ASTRA-380	"	"	"	"	"	"	"	x
ASTRA-278	"	"	"	"	"	"	"	x
ASTRA-378	"	"	"	"	"	"	"	x
DA-400	Max. unit ret. high act., bott. cracking	Gas oil, resid., high N feeds	Max. liq. yield	"	0.83*	"	REY	x
DA-250	"	"	"	"	0.85*	"	"	x
DXB-410	Bot. cracking w/ coke select. oct. bbl performance	"	Bot. upgrad. w/high oct. bbl yield	"	0.75*	"	Z-14-US/REHY	x
DXB-RN	"	"	"	"	0.73*	"	"	x
GENCAT-1	High act. flushing, good coke and gas select.	GO, resid	Liq. yield, act. maint. in high metal	"	0.78*	"	REHY	x
GO-35	High act. oct. bbl for best coke and dry gas select.	CGO, high N feeds	High oct. bbl N tolerance, low Br No.	"	0.75*	"	Z-14 USY	x
GO-30G	"	"	"	"	0.76*	"	G zeolite	x
GO-30	"	"	"	"	0.73*	"	Z-14-USY	x
GXO-41	High oct. w/low coke & gas, bot. upgrading	All types	Max. liq. yields	"	0.78*	"	REHY	x
GXO-40	"	"	"	"	"	"	"	x
GXO-29	High act./stab. w/high oct. bbl yied, coke & dry gas select., hydrothermal stab.	"	High oct. bbl	"	0.77*	"	Z-14 US	x
GXO-28	"	"	"	"	"	"	"	x
GXO-25	"	"	"	"	"	"	"	x
Super Nova-D	Max. oct. bbl, min. coke, max. retent., bot. cracking	"	Bot. upgrad. retent., high oct. bbl	"	0.75*	"	"	x
Nova-D	"	"	"	"	0.80*	"	"	x
Nova-G	"	"	"	"	0.70*	"	G zeolite	x
Super Resoc-X	Oct. bbl w/MON emphasis, bot. cracking, improved metals tolerance	"	High MON bbl w/ improved metals tolerance, bot. upgrading	"	0.67*	"	Z-14 US	x
Resoc-1	"	"	"	"	0.72*	"	"	x
Super Resoc-G	"	"	"	"	0.76*	"	G zeolite	x
Resoc-G	"	"	"	"	0.69*	"	"	x
Super Resoc	"	"	"	"	0.76*	"	Z-14 US	x
Super Octacat-B +	Max. oct. w/unsurpassed stab., coke & dry gas select., metals tolerance	"	Highest gaso. octs.	"	0.72*	"	Z-14 USY	x
Super Octacat-B	"	"	"	"	0.72*	"	"	x
Octacat-D	"	"	"	"	0.75*	"	"	x
Octacat +	"	"	"	"	0.72*	"	"	x
Octacat	"	"	"	"	"	"	"	x
Super Octacat-RNX	Improved gaso./oct. relationship	"	"	"	0.72*	"	G zeolite	x
Super Octacat-RN +	"	"	"	"	"	"	"	x
Octacat-RN +	"	"	"	"	0.74*	"	"	x
Octacat-RN +	"	"	"	"	"	"	"	x
Onion-910G	Optimum coke and gas select. for high Ni applications	"	High oct. bbl with	"	0.72*	"	G zeo./MMP	x
Onion-814G	"	"	"	"	"	"	"	x
Onion 432G	"	"	"	"	0.75*	"	"	x
Onion-900	"	"	"	"	0.72*	"	Z-14 USY/MMP	x
Onion-710G	"	"	"	"	0.75*	"	G zeo./MMP	x
Onion-700G	"	"	"	"	"	"	"	x
Onion-600G	"	"	"	"	0.77*	"	"	x
XP-800	Novel active matrix for max. bottoms upgrading capability	All types, wide range of octane bbl appl's	High oct. bbl, low bottoms yield	"	0.74*	"	Z-14 USY	x
XP-750 +	"	"	"	"	0.75*	"	"	x
XP-750L	"	"	"	"	0.74*	"	"	x
XP-800GL	Novel active matrix with improved gaso./oct. relationship	"	"	"	"	"	G zeolite	x
XP-750G +	"	"	"	"	0.75*	"	"	x
ZP-750GL	"	"	"	"	"	"	"	x
XP-750G	"	"	"	"	"	"	"	x
Additive O-HS	Solid add. for increased octane and LPG	Gas oil resid	High oct. and LPG prod.	MS	0.77*	"P"	"P"	x
Additive GSO	Solid add for incr. FCC oct.	"	"	"	0.75*	"P"	"P"	x
ENGELHARD CORP.								
HEZ 55	High stab. with max. gaso. selectivity, min. slurry	VGO, resid	Max. gaso. selectivity & bottoms upgrading	MS	0.9	In-situ SiO ₂ /Al ₂ O ₃	Zeolite, moderate RE, high SA	x
MAGNASIV 380	High gaso. selectivity with low coke & gas high bottoms upgrading	"	"	"	"	"	"	x
ULTRADYNE 940-960	High activity, low matrix, gaso. selectivity	VGO, resid, High N	Low coke, low Br No., high gaso.	"	"	"	"	x
OCTISIV PLUS 580	Low coke & gas, high oct. bbl	VGO, resid	High oct. bbl with low coke & gas	"	1.0*	"	USY, moderate matrix	x
140-160	"	"	"	"	"	"	USY, RE, moderate matrix	x
ULTRADYNE PLUS 1540-1570	Oct. bbl with reduced coke & gas	VGO, resid, high metals	"	"	0.9*	"	USY, RE, low matrix	x
DYNASIV 740-770	High gaso. selectivity with low coke & gas, high bottoms upgrading	VGO, resid	Max. gaso. selectivity & bottoms upgrading	"	"	"	Zeolite, moderate RE	x

Fluid catalytic cracking—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
DYNASIV PLUS 840-870	Oct. bbl with increased bottoms upgrading	"	Oct. bbl with increased bottoms upgrading	"	"	"	USY, RE, moderate	x
OCTIDYNE 1140-1170	Oct.	"	Oct. with bottoms upgrading	"	"	"	"	x
OCTIDYNE EXTRA 40-70	High oct. with increased gaso. selectivity	"	High oct. with increased gaso. selectivity	"	"	"	"	x
NITRODYNE 1440-1480	Gaso. selectivity with difficult feeds	High N feeds	Low Br. No., high gaso.	"	"	"	Zeolite, RE matrix	x
PRECISION 50-70	Max. oct. with reduced coke & gas	VGO, resid	Max. oct. in regenerator or compressor-strained units	"	"	"	Pyrochem zeolites	x
DIMENSION 50-70	High oct. with max. metals tolerance, low coke & gas	"	High metals operations or regen./comp.-strained units	"	"	"	Zeolite, "P" matrix	x
DIMENSION II 50-70	"	"	"	"	"	"	Pyrochem zeolite, "P" matrix	x
Z-100	High max. unit retention	"	Increased oct. and C ₃ /C ₄ olefins	"P"	"P"	"P"	"P"	x
Combustion promoter	"	All feeds	"P"	"P"	"P"	"P"	"P"	x
INTERCAT CORP.								
Z-CAT PLUS	Octane additive, high LPG yield	FCC feeds	High oct. gaso. high LPG yield	"P"	50	"P"	ZSM-5	x
ISOCAT	Oct. additive, moderate LPG yield	"	High oct. gaso. moderate LPG yield	"	"	"P"	"	x
KATALISTIKS INTERNATIONAL INC.								
ALPHA-540	High activity oct. catalyst	Gas oil, resid, reduced crude	Max. oct. bbl with high selectivities	MS	0.77*	Silica/alumina	LZ 210 in an active matrix	x
ALPHA-550	High activity gaso. catalyst	"	Max. gaso. with high oct. bbl	"	0.77	"	"	x
ALPHA-550B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.77*	"	"	x
ALPHA-550B11	Maximum bottoms cracking	"	Minimum bottoms	"	0.77*	"	"	x
ALPHA-560LC	High stab., lowest coke yield	High nitrogen/coke gas oil	Highest gaso., selectivity, low Br no.	"	0.77*	"	"	x
ALPHA-640	High activity oct. catalyst	Gas oil, resid, reduced crude	Max. gaso. with high oct. bbl	"	0.76*	"	"	x
ALPHA-650	High activity gaso. catalyst	"	"	"	0.76*	"	"	x
BETA-540	Max oct./high gaso. selectivity/metals tolerance	"	Max. octane, coke selectivity	"	0.77*	"	"	x
BETA-540SM	High metals tolerance/max. oct./high gaso. selectivity	High nickel feeds	Maximum nickel tolerance	"	0.77*	"	"	x
BETA-550	High oct./stab./metals tolerance	Gas oil, resid, reduced crude	High octane/coke selectivity	"	0.77*	"	"	x
BETA-550B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.77*	"	"	x
BETA-550B11	Max. bottoms cracking	"	Minimum bottoms	"	0.77*	"	"	x
BETA-560LC	Highest stab./lowest coke yield	High nitrogen/coke gas oil	High octane/low bromine numbers	"	0.77*	"	"	x
BETA-640	Max. oct./high gaso. selectivity/metals tolerance	Gas oil, resid, reduced crude	Maximum octane/coke selectivity	"	0.76*	"	"	x
BETA-650	High oct./stab./metals tolerance	"	High octane/coke selectivity	"	0.76*	"	"	x
EPSILON-431	High oct. with high act.	"	High octane/with high gasoline selectivity	"	0.75*	"	"	x
EPSILON-531	"	"	"	"	0.74*	"	"	x
EPSILON-531B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.74*	"	"	x
EPSILON-531B11	Max. bottoms cracking	"	Minimum bottoms	"	0.74*	"	"	x
EPSILON-631	High oct. with high activity	"	High octane/with high gasoline/select.	"	0.74*	"	"	x
OMEGA-154	Oct. bbl, enhanced bottoms cracking	"	High stability/metals tolerance/octane barrels	"	0.76*	"	LZ 210K in a high activity matrix	x
OMEGA-154B11	Max. bottoms cracking	"	Minimum bottoms	"	0.76*	"	"	x
OMEGA-162	Max. R + M/2, enhanced bottoms cracking	"	High olefinicities, maximum R + M/2, excellent gasoline	"	0.75*	"	"	x
OMEGA-164	High oct., max. bbl	"	High stability/metals tolerance octane barrels	"	0.75*	"	"	x
OMEGA-362	Max. iso-olefins and MON, enhanced bottoms cracking	"	High stability, maximum MON, maximum iso-olefins/metals tolerance	"	0.75*	"	"	x
OMEGA-364	high iso-olefins and MON, enhanced bottoms cracking	"	High stability, high MON and iso-olefins/metals tolerance	"	0.75*	"	"	x

Fluid catalytic cracking—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
OMEGA-364B11	Max. bottoms cracking	"	High stability, high MON and iso-olefins/metals tolerance/minimum bottoms yield	"	0.75*	"	"	x
ZETA-746	Active multifunctional matrix, excellent metals tolerance	Resid	Metals tolerance/heavy bottoms cracking high liquid, max. mid-bbl yield	MS	0.77*	Silica/alumina	LZ 210 in a high activity matrix	
ZETA-964	"	"	Metals tolerance/heavy bottoms cracking, high oct.	"	0.75*	"	"	x
SIGMA-300 PLUS	High oct. bbl with good coke and gas selectivity/4 activity levels for dist. or gaso. operations	Gas oil, resid, reduced crude	High liquid, max. mid-bbl yields/low coke and gas make	"	0.77*	"	High silica, low rare earth zeolite and matrix	x
SIGMA-400 PLUS	"	"	"	"	0.76*	"	"	x
SIGMA-500 PLUS	high oct. bbl with good coke and gas selectivity	"	"	"	0.76*	"	"	x
SIGMA-500 PLUS B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.75*	"	"	x
SIGMA-500 PLUS B11	"	"	Minimum bottoms	"	0.75	"	"	x
SIGMA-600 PLUS	High oct. bbl with good coke and gas selectivity	"	High liquid, max. mid-bbl yields/low coke and gas make	"	0.75*	"	"	x
GAMMA-419	High RON and MON, max. oct. bbl/high stab., excellent selectivity	"	High liquid, mid-bbl yields/low gas, coke and 650+ yields	"	0.76*	"	High silica, zeolite and matrix	x
GAMMA-419 PLUS	High stab./metals tolerance/oct. bbl	"	"	"	0.76*	"	"	x
GAMMA-419 PLUS B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.76*	"	"	x
GAMMA-419 PLUS B11	Maximum bottoms cracking	"	Min. bottoms	"	0.76*	"	"	x
SIGMA-300	General purpose/4 activity levels	Gas oil, resid, reduced crude, high nitrogen, coker gas oil	High liquid, max. mid-bbl yields, low 650+ yield and low gas/attrition/resistance/low Br no./high isobutane yield/balanced butane yields	"	0.77*	"	Mixed premium quality zeolite matrix	x
SIGMA-400	"	"	"	"	0.75	"	"	x
SIGMA-500	"	"	"	"	0.75	"	"	x
SIGMA-500 B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.75*	"	"	x
SIGMA-500 B11	Maximum bottoms	"	Min. bottoms	"	0.75*	"	"	x
SIGMA-600	General purpose	"	High liquid, max. mid-bbl yields/low 650+ yield and low gas/attrition resistance/low Br no./high isobutane yield/balanced butane yields	"	0.74*	"	"	x
EKZ-4	General purpose/3 activity levels	Gas, dirty feeds, coker gas oils	High liquid yields, low gas and coke	"	0.77*	"	Fully REO exchanged zeolite	x
BMZ-3	Flexible for max. dist. or max. gaso./4 activity levels	Gas oil, resid, reduced crude, high nitrogen, coker gas oil	High liquid, max. mid-bbl yield/low 650+ yield and low gas/attrition resistance/low Br no. high isobutane yield	"	0.78*	"	High silica, full rare earth exchanged zeolite matrix	x
BMZ-4	"	"	"	"	0.76*	"	"	x
BMZ-5	"	"	"	"	0.75*	"	"	x
BMZ-5B	Enhanced bottoms cracking/metals resistance	"	Enhanced LCO selectivity	"	0.75*	"	"	x
BMZ-5B11	Max. bottoms cracking	"	Min. bottoms	"	0.75*	"	"	x
BMZ-5LC	Highest stab./lowest coke yield/metals tolerance	High nitrogen/coker gas oil	Max. gaso./low Br no.	"	0.75*	"	"	x
BMZ-6	Flexible for max. dist. or max. gaso.	Gas oil, resid, reduced crude/high nitrogen, coker gas oil	High liquid, max. mid-bbl yield/low 650+ yield and low gas/attrition resistance/low Br no./high isobutane yield	"	0.74*	"	"	x
MOBIL CHEMICAL INTERNATIONAL LTD.								
ZSM-5	Oct. enhancement, light olefins production	VGO	FCC gaso.	"	"	ZSM-5	Contact FCC vendors	

Hydrocracking catalysts

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
ABB LUMMUS CREST INC.								
LC-Fining	Hvy. feed, metals tolerance	Atm. bott., vac. bot., hvy. crudes, tars, etc.	Dist., low-S fuel	Cyl.	Low	"P"	CoMo/NiMo	L
AKZO CHEMICALS INTERNATIONAL BV								
Ketjenfine, LC-Fining (See ABB Lummus Crest HC listing)		Atm. vac. btms., hvy. crudes, bitumen, etc.	Dist., LSFO	Cyl.	Low	"P"	CoMo & NiMo	L
Ketjenfine H-Oil (HRI Texaco)								
KF-1302	Ebullating bed resid HC	Atm. + vac. btms., heavy crudes, bitumen				"P"	NiMo	L
KF-1303						"P"		
AKZO CHEMICALS/NIPPON KETJEN (all catalysts are available in EasyActive off-site presulfided form).								
KC-2001		VGO	Gasol./jet	Cyl.	48	"P"		x
KC-2100		VGO	Gasol.	"	41	"P"		x
KC-2200		VGO	Mid.-dist.	"	54	"P"		x
KC-2600		VGO	"	"	45	"P"		x
BP								
MD-2		VGO	Mid. dist.	"		"P"	"P"	L
CHEVRON RESEARCH CO. & TECHNOLOGY CO.								
ICR 106	First stage/once-through HDN and HC, 2nd stage HC for mid-distillate	VGO, CGO, LCO, AGO, 1st stg. HC prod	Diesel, jet, naphtha, 2nd stage feed	Cyl. ext.	58	"P"	"P"	L
ICR 120	Second-stage HC for max. dist.	"	"	"	53	"P"	"P"	L
ICR 126	First stage/once-through HDN and HC, high stability	VGO/CGO/LCO AGO	" + 2nd stg. feed	58	"P"	"P"	"P"	L
ICR 113	Lower cost	" + DAO	Diesel, jet, naphtha	"	50	"P"	"P"	L
ICR 117	First stage/once-through, high naphtha select., high stab.	VGO, CGO, LCO, AGO	"	53	"P"	"P"	"P"	L
ICR 136	First stage/once-through, high naphtha select., exc. stab.	VGO, CGO, LCO, AGO	Diesel, jet, naphtha, 2nd stage feed	Cyl.	54	"P"	"P"	L
ICR 204	Second-stage HC for max. naphtha/jet	Hydrofined GO,	Reform. feed, it. naphtha/jet	"	50	"P"	"P"	L
ICR 208	" and high stab.	Hydrorefined	Reformer feed,	"	43	"P"	"P"	Contact Chevron
ICR 207	" exc. stab.	VGO, CGO, LCO	it. naphtha, jet	"	35	"P"	"P"	L
ICR 209	" exc. stab.	"	"	"	"	"P"	"P"	Contact Chevron
GC-36	Max. gasol. HC	Dist. it. gas oils	Gasol., naphtha kero. jet	"	50-60	SiO ₂ /Al ₂ O ₃	"P"	x
GC-30	Max. dist. HC	Dist., hvy. VGO	Furnace oil, diesel, jet, kero.	"	50-60	"	"P"	L
CRITERION CATALYST CO. LP								
C-354	Hvy. distillate HC	Gasols, VGO	HC feed	Cyl. or Sh. ext.	65	Al ₂ O ₃	NiW	x
C-454	Hvy. distillate HC	Gasols, VGO	HC feed	"	67	"	"	x
C-424	HDN, 1st stage HC	Gasols, VGO	HC feed	Sh. ext.	52	"	NiMo	x
C-411	HDN, 1st stage HC	Gasols, VGO	HC feed	"	54	"	"	x
GC-30,36	(See Chevron listing)							L
HDS-1442	Ebullating bed	Resid		Cyl.	34	Al ₂ O ₃	CoMo	x
HDS-1443	Ebullating bed	Resid		"	36	Al ₂ O ₃	NiMo	x
HDS-2443	Ebullating bed	Resid		"	"P"	"P"	"P"	L
HDS-4443	Ebullating bed	Resid		"	"P"	"P"	"P"	L
HDN-60	HDN, 1 st stage HC	Gasols, VGO	HC feed	Sh. ext.	54	Al ₂ O ₃	NiMo	x
MD-2	(See BP HC listing)							L
Z-703	(See Zeolyst Enterprises HC listing)							
Z-753	(See Zeolyst Enterprises HC listing)							
Z-763	(See Zeolyst Enterprises HC listing)							
CROSFIELD CATALYSTS								
594	HDN, 1st stage HC	AGO, VGO	2nd stage feed	Katform 1/16-1/8	51	Al ₂ O ₃	NiO/MoO ₃	x
599	"	"	"	"	57	"	"	x
KAT 4000	Ebullated bed HC	Resid (H-Oil), (LC-Fining)	FCC feed	1/32 cyl.	34	"	CoO/MoO ₃	x
5000	"	"	"	"	"	"	"	x
DAVISON CHEMICAL DIVISION, W.R. GRACE & CO. (Arranged in decreasing order of activity)								
GR-12	Ebullating bed HC	Resid, bitumen	Dist., LSFO	Cyl.	"P"	Al ₂ O ₃	CoO/MoO ₃	L
GR-14	"	"	"	"	"P"	"	NiO/MoO ₃	L
LEUNA-WERKE AG								
9514	High selectivity	Unrefined VGO	Mid. dist., HC paraffins	Cloverleaf twisted vortex	0.50"	Al ₂ O ₃ /SiO ₂	NiOMoO ₃	x
9522	In comb. with 9514	"	"	"	0.50"	" + zeo.	"	x
9534	High-pressure applications	Unrefined mid. dist.	Gasol. comp., DO	Tab.	0.70"	Zeolite	"	x
9536	"	" + AGO	"	Ring tab.	0.65"	Zeolite	CoO WO ₃	x
9562	Select. HC of n-paraffins	Naphtha fractions	Gasol.	Sph.	0.55"	Zeolite	Pt	x
9570	Hydrodewaxing	Refined mid. dist., AGO	DO, imp. cloud pt.	Cloverleaf	0.70"	"	NiOWO ₃	x
LYONDELL LICENSING INC.								
ARCO H-H Cat		Raw lube stock	High quality lube	"	48			L
MOBIL CHEMICAL INTERNATIONAL LTD.								
MLDW	Selective, dewaxes total viscosity range	Waxy base oils	Lube basestocks	Cyl.	35	"P"	ZSM-5	L
MDDW	Selective, n-paraffin removal, cloud pt. reduc.	AGO, VGO	DO, Jet.	"	35	"P"	"	L

Hydrocracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc	Carrier, support	Active agents	Availability
PROCATALYSE								
HYC 542	High cracking act.	Gas oil, VGO	Kero., GO	Ext.	"	Special	NiMo	X
HYC 532	Cracking act.	"	GO	"	"	"	"	X
HYC 552	High cracking act.	"	Naphtha, Kero.	"	"	"	"	X
SHELL INTERNATIONAL CHEMICAL CO. LTD.								
S-753	Naphtha selective, stable activity and selectivity	AGO, VGO, LCO, HCO, CGO	Naphtha, jet.	Cyl.	40	Zeo.	Non-noble metal	Contact Criterion
S-703	Heavy feedstocks with low gas make	"	" + diesel	"	"	"	"	"
UNOCAL/UOP								
DHC-2	Bifunctional, strong hydrogenation, good crack. act.	VGO, DAO, CGO, other non-SR gas oils	High select. to mid. dist.	Sph.	41	Amorphous	"P"	"
DHC-6	Bifunctional, good hydrogenation, very good crack. act.	"	"	"	44	"	"P"	"
DHC-8	Bifunctional, excellent hydro., very good crack. act., imprv. temp. stability	"	"	"	44	"	"P"	"
DHC-100	Bifunct., excell. hydro., imp. crack. act., greater temp. stab.	"	"	Ext.	"P"	"P"	"P"	"
HC-6	2nd stage high act., very act., stable	"	High naphtha select.	Cyl.	42	Zeolite	"P"	"
HC-100	" + more act. than HC-6	"	"	"	48	Zeolite	"P"	"
HC-14	Flexibility for fuels	Virgin cracked dist.	Gasol., kero., jet.	Cyl.	"P"	Mol sieve	Non-noble metals	L
HC-16	"	VGO	dist. VGO	"	"P"	"	"	L
HC-18	Max. gasol., LPG, naphtha	"	LPG, gasol., petchem. naphtha	"	"P"	"	Noble metals	L
HC-22	Max. diesel, jet	"	Diesel, jet	"	"P"	"	Non-noble metals	L
HC-26	"	"	"	"	"P"	"	"	L
HC-28	Max. LPG, gasol., petchem. naphtha	"	LPG, gasol., petchem. naphtha	"	"P"	"	Noble metal	L
HC-30	Select. HC for pour pt. red.	Petroleum & shale oil fractions	Low pour pt. dist. lube stocks, syn-crudes	"	"P"	"	Non-noble metals	L
HC-80	"	"	"	"	"P"	"	"	L
ZEOLYST ENTERPRISES								
Z-753	Naphtha selective, stable activity and selectivity	AGO, VGO, LCO, HCO, CGO	Naphtha, jet.	Cyl.	40	Zeo.	Non-noble metal	Contact Criterion
Z-763	High organic-N tolerance	"	"	TL	44	"	"	"
Z-703	Heavy feedstocks with low gas make	"	Naphtha, jet, diesel	Cyl.	40	"	"	"
Z-704A	Saturation and conversion of N and S-containing gas oils	GO, LCO, HCO, CGO	Jet, diesel, naphtha	"	34	"	Noble metal	L
Z-714A	Saturation with reduced conversion	"	Jet, diesel	"	"	"	"	"
Z-714C	Saturation/cracking option	"	"	"	"	"	"	Contact Criterion

Mild hydrocracking catalysts

AKZO CHEMICALS INTERNATIONAL BY NIPPON KETJEN (All catalysts available in Easyactive off-site presulfided form)								
KF-1011	Conversion & HDS	VGO	Mid. dist.	Cyl.	51	Al ₂ O ₃	NiMo	X
KF-1012	"	"	"	"	42	"	CoMo	X
KF-1014	"	"	"	"	42	"	"	X
KF-1015	"	"	"	"	42	"	NiMo	X
KF-1016	"	"	"	"	"	"	"	X
KF-1017	"	"	"	"	"	"	NiMo	X
KC-2600	"	"	"	"	45	"	"P"	X
TLF-141 (Eli)	"P"	Pour pt. protect	"	"	"P"	"P"	"	L
BP								
MH-128	Mid. dist. selectivity	VGO	"	Sh. ext.	45	"P"	"P"	X
CATALYSTS & CHEMICALS INDUSTRIES CO. LTD.								
HT-03	High mid. dist. yield	VGO	Kero., diesel & desulf.	Cyl.	0.78"	Al ₂ O ₃	"	X
HT-05	"	"	"	"	0.78"	"	"	X
HT-07	High HDS, mid. dist. yield	"	"	"	0.78"	"	"	X
CHEVRON RESEARCH & TECHNOLOGY CO.								
ICR 106	High cracking act., select. for mid-dist.	VGO, CGO, LCO, AGO	Diesel, FCC feed, LSFO	Cyl.	58	"P"	"P"	L
ICR 126	Longer life, higher conv.	"	Diesel, naphtha, FCC feed, LSFO	"	58	"P"	"P"	L
ICR 114	Lower cost	"	Diesel, FCC feed, LSFO	Cyl., sh.	46	"P"	"P"	L
CRITERION CATALYST CO. LP								
HCM-40.110	(See Unocal MHC listing)	"	"	"	"	"	"	"
CROSFIELD CATALYSTS								
497	Combined conver. & HDS act.	Gas oils	Mid. dist.	Katform	44	Al ₂ O ₃	CoO/MoO ₃	X
499	Combined conver. & deep HDS act.	"	"	1/16, 1/8	50	"	"	X
594	Combined conver. & high HDS, HDN act.	"	"	"	51	"	NiO/MoO ₃	X
599	Combined conv. & deep HDS, HDN act.	"	"	"	57	"	"	X
ENGELHARD CORP.								
HPC-50	High act. N removal, polynuclear aro. sat., high S removal, severe operations	HVGO, VGO, LCO, CGO, coker dist., lube stocks	FCC, HC feed pre-treat, lubes	Kloverleaf cyl., ext. 4-lobed	51	"P"	NiMo/MoO ₃	X

Mild hydrocracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
EXXON RESEARCH & ENGINEERING CO.								
RT-2	Tailored for resids	Resid	Naphtha, diesel			Tailored pore size	CoMo	L
RT-228	"	"	"			"	NiMo	L
RT-621	"	"	"			"	CoMo	L
RT-3	Tailored for gas oils	Virgin cracked GOs	"			"	CoMo	L
TN-6	"	"	"			"	NiMo/CoMo	L
HALDOR TOPSOE								
TK-551	High stability MHC Hydrocracking	VGO	—	Ring/cyl.	49	Al ₂ O ₃	NiMo	x
TK-871	"	Atm./vac. resid	—	Cyl.	—	Al ₂ O ₃ /zeolite	"	x
LEUNA-WERKE AG								
8207	High hydrog. and HDN activity (Desus process)	VGO, HGO	DO	Vortex	0.70*	Al ₂ O ₃	NiMoO ₃	x
ORIENT CATALYST CO.								
HOP-501	Conversion & HDS	VGO	Mid. dist.	Sh. Ext.	"P"	Al ₂ O ₃	"P"	x
HOP-551	"	"	"	"	"P"	"	"P"	x
PROCATALYST								
HTH 548	Good Sta., high mid. dist. selectivity	HVGO	—	Cyl.	—	SiO ₂ /Al ₂ O ₃ + promoter	NiMo	x
UNITED CATALYSTS INC.								
C20-7-02	Composition, physical properties	Lube oil, HVGO	Hydrog. olefins	Ext.	44	Al ₂ O ₃	NiMo	x
C20-7-02CDS	"	"	cracked product	"	—	"	"	x
C20-7-04	"	"	"	"	50	"	"	x
C20-7-06CDS	"	"	"	"	44	"	"	x
UNOCAL CORP.								
HCM-40	High stab. MHC	Virgin & cracked dist., VGO	Dist. + hot feed hydrotreated	Sh. ext.	"P"	"P"	"P"	L
HMC-110	"	"	"	"	"P"	"P"	"P"	L
UOP								
DHC-2	Bifunctional clean-up, hydrog., good cracking act.	VGO, CGO	Dist. HDS, lubes	Sph.	41	"P"	"P"	x
MHC-10	"	"	"	Cyl.	42	"P"	"P"	x

Hydrotreating/hydrogenation/saturation catalysts

AKZO CHEMICALS INTERNATIONAL BV NIPPON KETJEN (All catalysts available as off-site presulfided, Q = quadratobe)

KF-542-S-4Q	Act. suppt., rpt. inert material	All types	Q	30	Al ₂ O ₃	NiCoMo	x
KF-542-9R	"	"	Rings	35	"	"	x
KAS-5B	"	"	Sph.	0.87*	"	NiMo	x
AS-20	"	"	Q	0.62*	"	NiCoMo	x
KG-1	Descaling/guard	"	Sph.	0.62*	"P"	"P"	x
KF-H-Oil							
"	Ebullating bed	Resid., hvy. crude, Dist., LSFO	Cyl.	"P"	Al ₂ O ₃	CoMo	L
"	"	bifumen	"	"P"	"	NiMo	L
KFR-10	Fixed bed	Resid HDM	Q	"	"	"	L
KFR-11	Fixed Bed	Resid HDM	"	"	"	"	x
KFR-30	"	Resid HDM/HDS	"	"	"	"	x
KFR-50	"	Resid HDS	"	"	"	"	x
KFR-70	"	"	"	"	"	"	x
KF INT-RI	"	Resid HDM	"	"	"	"	x
KF-840	High HDN, HDS, sat.	Naph. to VGO, FCC/MC-PT, lube	"	51	"	"	x
KF-842	High HDN/HDS	SR/cr. naph./CO	"	47	"	"	x
KF-843	Highest HDN/HDS/aro. sat.	FCC/MC-PT, lube	"	56	"	"	x
KF-844	High HDS/HDN	Cracked naph.	"	47	"	"	x
KF-845	"	Naph. to VGO,	"	44	"	"	x
KF-852	L.P. aro. sat.	Diesel	"	"	"	"	x
"	"	hydrogen	"	"	"	"	x
KF-8010	"	FCC-PT, lube	Cyl.	54	"	"	x
KF-330	H.P. aro. sat.	Naph. to VGO	"	52	"	NiW	x
KF-124 LD							
KF 124 HD	Gen. purp. HDT	SR naph. to dist.	Cyl.	38	"	CoMo	x
KF 165	"	"	"	46	"	"	x
KF-702	High HDS act.	Naph. to VGO	"	0.79*	"	"	x
KF-707	"	"	"	0.76*	"	"	x
KF-742	Deep HDS	"	"	0.75*	"	"	x
KF-746	"	FCC-PT, lube	Q	45	"	"	x
KF-752	Highest HDS act.	Diesel to VGO	"	0.61*	"	"	x
"	"	"	"	47	"	"	x
KF-901H							
KF-643	High HDS/HDM/MHC	Naph. to VGO	Cyl.	47	"	NiMo/CoMo	x
KF-645	HDM/HDS of resid	Resid	Q	39	"	"	x
KF-645	HDM/HDS/CCR/ asphalt-removal	HVGO/DMO/DAO	"	36	"	CoMo	x
BASF							
M 8-10	"	Coker benzene	Tablets	0.70*	Al ₂ O ₃	CoO/MoO ₃	x
M 8-12	"	Naphtha, kero., mid. dist.	Cyl. ext.	0.70*	"	"	x
M 8-14	"	HGO/VGO	Star + cyl ext.	0.75*	"	"	x
M 8-21	"	Blend of HGO/VGO	"	0.70*	"	NiO/MoO ₃	x
M 8-25	Aro. hydrogenation	w/cracked oils	Cyl. ext.	0.82*	"	"	x
M 8-26	High HDN/HDS act., olefin hydrogenation	Kerosine, Imprv. smoke pt. Naphtha, Kero., mid. dist., VGO, HGO	Star + cyl. ext.	0.85*	Special	"	x
M 8-30	"	Coker benzene	Cyl. ext.	0.72*	Al ₂ O ₃	MoO ₃	x

Hydrotreating/hydrogenation/saturation catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
H 0-11	Select. hydro. of acetylene in ethylene		Ethylene	"	0.46*	SiO ₂	Pd	x
H 0-12	Select. hydro. of butadiene	Ethylene plant C ₄ streams	Butenes, alkylate feedstocks	Cyl. ext.	1.1*	Al ₂ O ₃	"	L
H 0-22	Select. hydro. of diolefins, unsat. aros.		Py. gaso.	Cyl. ext. + sph.	0.65-0.80*	"	"	x
H 1-80	Hydro. of aromatics		Food-grade white oil	Cyl.	1.0*	SiO ₂	Ni	x
CRITERION CATALYST CO. LP.								
AS-100	(See Unocal listing)							
C-127	Front end resid HDS	Hvy. resid with moderat metals content		Cyl.	44	Al ₂ O ₃	NiMo	x
C-227	Tail end deep resid HDS	"		Cyl.	44	"	CoMo	x
C-147	Front end resid HDS	"		Cyl.	44	"	"	x
C-247	Tail end resid HDS	"		Cyl.	44	"	"	x
C-204	Hydrog. of olefins	Kero., specialty oils		Cyl.	"P"	"	"P"	x
C-214i	Multi-purpose HDT	Naphtha to HVGOS		Sh. ext.	38	"	NiMo	x
C-311	Hydrocracker tail end	Hydrocracked feed		Sh. ext.	48	"	"	x
C-344	Heavy duty HDS	Wide variety of stocks, HVGOS		Sh. ext.	46	"	CoMo	x
C-424	High act. HDS/HDN, sat.	Pretreat FCC feed		Sh. ext.	52	"	NiMo	x
C-444	High activity HDS	VGO/LGO/HGO/cracked GO		Sh. ext.	46	"	CoMo	x
C-447	Deep HDS	VGO/resid/LGO, HGO		Sh. ext.	45	"	"	x
C-448	Low-sulfur diesel	Mid. distillate/VGO		Sh. ext.	44	"	"	x
C-514	Support function, replaces inert material	All HDT applications, preferentially cracked feeds		Shp.	51	"	NiMo	x
C-544	Support function, replaces inert material	"		Sph.	44	"	CoMo	x
C-614.624	Hydrog. of aro.	Jet. Kero., specialty oils		Cyl.	"P"	SiO ₂ /Al ₂ O ₃	Pt, PtPd	x
C-874A	Acetylene to ethylene	Kero., specialty oils		Cyl.	49	Al ₂ O ₃	Noble metal	x
TRILOBE HDS-3		Naphthas, VGO		Sh. ext.	44	Al ₂ O ₃	NiMo	x
HDS-9		Naphthas, VGO		Cyl.	52	"	"	x
TRILOBE HDS-9		Naphthas, VGO		Sh. ext.	48	"	"	x
HDN-60	HDN, 1st Stage HC	Gas oils, VGO		Sh. ext.	54	"	"	x
HDS-22		Naphthas, VGO		Sh. ext.	43	"	CoMo	x
IMP-DSD-3	(See Instituto Mexicano del Petroleo listing)							
Z-704A	(See Zeolyst Enterprises Hydrotreating/Hydrogenation listings)							
CROSFIELD CATALYSTS								
477	High HDS	Naphtha thru GOs	Ref./diesel treating FCC feed	Cyl.	44	Al ₂ O ₃	CoO/MoO ₃	x
479	Deep HDS sat., HDN	Dist. thru hvy. GOs	Diesel trtg./FCC fd.	Cyl.	50	"	"	x
497	High HDS	Naphtha thru GOs	"	Katform	44	"	"	x
499	Deep HDS, sat.	Naphtha thru hvy. GOs	"	"	50	"	"	x
520	High pore vol., high resist. to SiO ₂ , Pb, As poisoning, HDS	Naphtha blends	Reforming	Kat form 1/16"	38	"	NiO/MoO ₃	x
502	HDS, HDN	" + coker dist. blends	Ref., jet., fuel oil	Cyl.	44	"	"	x
504K	High HDS/HDN/sat.	Naphtha thru GO blends, LCO	" + FCC feed	"	51	"	"	x
506	Deep HDS, HDN, sat.	100% coker naphtha hvy. GOs/LCO resid binds, lubes	Ref., FCC feed HC feed	"	58 57	"	"	x x
504	High HDS, HDN, sat.	Naphtha binds thru GO blends, LCO FCC feed	Ref., jet., fuel oil	Katform	51	"	"	x
535	High HDS, HDN, sat., low dens.	Naph. binds thru GO binds, LCO	"	"	42	"	"	x
599	Deep HDS, HDN, sat.	Coker feeds, hvy. GOs GO & resid binds, lube	Ref., FCC feed, HC feed	"	57	"	"	x
550	Olefin & aro. sat.	Cracked stocks/coker stocks		Cyl.	49	"	"	x
620	Demet. catalyst	HGO/VGO resid	Demet. feed to main binds DHT bed	Cyl.	35	"P"	"P"	x
ENGLEHARD CORP.								
HPC-3	Low density, high pore vol.	Naphtha thru VGO HDS		Kloverleaf or cyl.	33	Al ₂ O ₃	CoO/MoO ₃	x
HPC-40B	HDS, HDN	CGO, HVGOS, LCO, FCC gaso., jet		"	47	"	NiO/MoO ₃	x
HPC-312	Active base, high act.	sev. HDS/HDN resid., FCC feed pret.		custom	"	"	NiMo + "P"	x
HPC-416	" + max. stab.	"		"	"	"	"	x
HPC-50	HDS, HDN, PNA sat., high act. HDS/HDN/PNA sat., severe operations	Dist. naphtha, lube	" + lube FCC feed, HC pretreat, lube	"	51	"	"	x
HPC-60	High act. HDS	HS HGO, hrg. oil, hvy. VGO	GO, hrg. oil, gaso.	"	44	"	CoO/MoO ₃	x
Ni 4352	High yields	HC/lube oil finish., aro. sat. naphtha		"	59	SiO ₂ /Al ₂ O ₃	NiW	x
Ni 4342	"	"		"	"	"	"	x

Hydrotreating/hydrogenation/saturation catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
EXXON RESEARCH & ENGINEERING CO.								
RT-3	High act., regenerability	Virgin cracked naphthas, dist.	Feed prep. for ref., jet./diesel			Tailored pore size	CoMo NiMo/CoMo	L
TK-8								
HALDOR TOPSOE								
TK-250	HDS	Gas & Naphtha		Ring	30	Al ₂ O ₃	CoMo	x
TK-251							NiMo	x
TK-450	HDS, low density	Naphtha		Cyl.	35	"	CoMo	x
TK-550		SR & crack. GO, VGO		Ring/cyl.	46	"	"	x
TK-551	HDS, HDN			Ring/cyl.	49	"	NiMo	x
TK-525	HDS, extra HDN			Cyl.	47	"	"	x
INSTITUTO MEXICANO DEL PETROLEO								
IMP-DSD-3	High act. TRIL OBE	Petro. fract.	Naphtha, high diesel act. FCC feed	Sh. ext. Sph.	0.74* 0.55*	Al ₂ O ₃	Mo/Ni/P	L
IMP-DSD-4	High act. sphere				0.55*	"	Mo/Ni/P	L
IMP-DSD-5	Good act. sphere	Gas. to diesel	HDSNaphtha, good qual. diesel		0.55*	"	Mo/Ni/P	L
IMP-DSD-1					0.86*	"	Mo/Ni	L
LEUNA-WERKE AG								
6524	Hydrog. of benzene to cyclohex.	Benzene	Cyclohexane	Tab.	0.65*	Al ₂ O ₃	Ni	x
6526	Hydrog. of aro. deriv.	Phenol, cresol	Cyclohexanol, Methyl-cyclohexanols		0.70*	"	Ni	x
7741	Select. hydrog. of ethyne	C ₂ C ₄ front-end fractions	Ethene		0.90*	"	Pd + Prom.	L
7751	Select. hydrog. of methylacetylene and propadiene, or C ₄ acetylenes, or butadiene	C ₃ tail-end fractions	Propene, butenes	Sph.	1.00*	"	"	L
7752				Tab.	0.92*	"	Pd	L
7753					0.90*	"	"	L
7762	Select. hydrog. of styrene and dienes (1st stage)	Py. gaso.	Gas. or aromatics	Ext.	0.55*	"	"	x
8203	HDS, hydrog. of alkenes (2nd stg)	HDT, py. gaso.	Gas. or aromatics		0.65*	" + SiO ₂	NiOMoO ₃	x
8203 HS	Descaling/guard	Diff. HC fractions	Feed for HDS	Ring ext.	0.50*	"	"	x
8213	Guard/As removal			Ring	0.55*	Al ₂ O ₃	"	x
				Twisted ext.	0.60*	"	"	x
8214	Guard/HDM	Hvy. HC fractions	DMO		0.50*	"	"	x
PROCATALYSE								
LT 261	Selective hydrogenation of acetylene and MAPD	Steam cracker acetylene cuts	Ethylene, propylene	Sph.		Al ₂ O ₃	Pd. prom.	x
LT 279	Selective hydrogenation of acetylene	Steam cracker acetylene cuts	Ethylene	"		"	Pd	x
LD 271	Selective hydro. of propylene-rich cut from steam cracking, also butene-1-rich cut	Steam cracker propylene-rich butene-1-rich cut	Propylene, butene-1	"		"P"	Pd prom.	x
LD 273	MAPD removal from FCC C ₃ cuts	FCC C ₃ cut	C ₃ cut	"		"P"	"	x
LD 277	Acetylene removal from butadiene-rich steam cracker cut	C ₄ steam cracker cut	Butadiene-rich C ₄	"		"P"	"	x
LD277/3						"P"	"	x
LD 145	Select. hydrog. of py. gaso. & 180-400° C. fraction	Py. gaso.	Gas. special fuel	Powder	Ni	"	NiMo	x
LD 155		" + hvy. gaso.	Gas. special fuel	"	"	"	NiW	
LD 241	Select. hydrog. of py. gaso.	Py. gaso.	Sweet gaso.	"	"	"	Ni	
LD 265	Select. hydrog. of py. propylene cut, butylene cut, & gaso.	Py. propylene cut, butylene cut gaso.	Propylene, butylene, gaso.	"	"	"	Pd	
MEP 121	COS removal	C ₃ cut	C ₃ cut	Granules		Special		x
MEP 191	Arsenic removal			Sph.		Al ₂ O ₃		x
MEP 841		Naphtha	Naphtha to select. hydrogenation			"		x
LD 744	Hydrogenation	Aro. hydrogenation	Solvents	Pellets		Special	Ni	x
LD 748				Ext.		Al ₂ O ₃	Pt prom.	x
LD 402								
UNOCAL CORP.								
HC-B, D, F, H, K, J, DM (See Unocal Hydrotreating listing)								
AS-100	Sat. of aromatics	Naphtha, kero., jet. diesel fuel	Low aro. naphthas, high smoke pt. kero., jet., low-aro. diesel	Cyl.	"P"	"P"	Noble metal	L
N-21, N-22, N-23, N-30, N-100, N-108 (See Unocal Hydrotreating listing)								
UNITED CATALYSTS INC.								
C20-5-01		SR, coker naphtha, kero. diesel	HDS, removal of metal contaminants, imp. color, odor, stab.	Tablet or ext.	50	Al ₂ O ₃	CoMo	x
C20-6-01	Composition, physical properties	Lt. naphthas thru hvy. resids.	HDS hydrog. of olefins	Ext.	38	"	"	x
C20-6-03	"			1/8	44	"	"	x
C20-6-04	"			1/16	51	"	"	x
C20-7-02	"	Cracked stocks,	HDS/HDN, hydrog. of "		44	"	NiMo	x

Hydrotreating/hydrogenation/saturation catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
C20-7-03 C20-7-04	"	high olefin, N-content feed	olefins, de-wax	Ext.	38 50	"	"	x x
C20-6-04 CDS C20-7-07 CDS	High HDS act. High HDS/HDN act.	VGO/LGO/HGO Pretreat. FCC feed	FCC feed	Ext.	37-43 47-53	"	CoMo NiMo	x x
G-87 G-98B	Total hydrog. of benzene to cyclohexane	Benzene Benzene w/S	Cyclohexane	Sph. Tablet	52-58 48-52	SiO ₂	Ni Ni/Cu/Co	x x
C46-7-03 C-8-03	High hydrog. activity	Aro. sat.	"	Ext.	40-48	Al ₂ O ₃	Ni	x x
G-68A G-68C	Hydrog. of C ₃ dienes Select. hydrog. DPG-diolefins	Isoprene Py. gaso.	Gaso.	Tablet Sph.	32-38 42-48	"	Pd	x x
G-68D	Select. hydrog. trace butadiene & isom. B-1, B-2	C ₃ + C ₄ stream	Alky. feed	Tablet	64-69	"	"	x
C38-1 C20-7-06 CDS T-2484	Select. hydrog. trace butadiene with isomerization Saturation of C ₄ and C ₅ streams	C ₃ + C ₅ stream with S MTBE/TAME recycle Py. gaso.	" Feed for dehydro. Sat. hydrocarbons	Ext. " Cyl.	52-58 44 30	Al ₂ O ₃ " "	Ni NiMo Pd CoMo	x x x L
HR-836	Pretreat	"	"	"	"	"	"	"
ZEOLIST ENTERPRISES								
Z-704A	Hydrog. of PCA & mono-aros. in S and N-containing feeds	Fuels, solvents, lubes	Low aro. prods.	Ext.	"P"	Mole sieve	Noble metal	Contact Criterion

Hydrotreating catalysts

AKZO CHEMICALS INTERNATIONAL BV NIPPON KETJEN (All catalysts available in off-site presulfided form)

HC-DM, HC-J, HC-K	(See Unocal hydrotreating listing)	Q	"P"	"P"	NiMo	L	
RF-100, 200, 220, N-100, 168	"	1000	"	"	"	"	
GC-4, 7, 40, 405	(See Chevron Research & Technology Company listing)						
GC-100, 101, 102	"						
GC-105, 106, 107	"						
RT-2, 3, 4, 228, 601, 621	(See Exxon Research & Engineering hydrotreating listing)						
RT-NX-1, T-1-8	"						
KF-542-5 4Q	Act. Suppl., repl. inerts			Q	30	Al ₂ O ₃	NiCoMo
KF-542-9R	"			Rings	35	"	"
KAS-5B	"			Sph.	0.87"	"	NiMo
AS-20	"			Q	0.62"	"	NiCoMo
KG-1	Descaling/guard			Sph.	0.62"	"P"	"P"
KFR-10, 11	Fixed bed	Resid HDM		Q	"	Al ₂ O ₃	NiMo
KFR-30	"	Resid HDM/HDS		"	"	"	"
KFR-50	"	Resid HDS		"	"	"	"
KFR-70	"	"		"	"	"	"
KF-INT-R1	"	Resid HDM		"	"	"	"
KF-840	high HDN/HDS, sat.	Naph. to VGO		"	51	"	"
KF-842	High HDN/HDS	SR/cr. naph./CGO		"	47	"	"
KF-843	Highest HDN/HDS/aro. sat.	FCC/HC-PT, lube		"	56	"	"
KF-844	High HDS/HDN	Cracked naph.		"	47	"	"
KF-845	"	Naph. to VGO		"	44	"	"
KF-852	LP aro. sat.	Diesel/hydrogen		"	"	"	"
KF-8010	High HDS/HDN	FCC-PT, lube		Cyl.	54	"	"
KF-330	H.P. aro. sat.	Lube		"	52	"	NiW
KF-124LD	Gen. Purp. HDT	SR naph. to dist.		"	38	"	CoMo
KF-124HD	"	SR naph. to dist.		"	48	"	"
KF-165	"	Naph. to VGO		"	0.79"	"	"
KF-702	High HDS cat.	Naph. to VGO		"	0.76"	"	"
KF-707	"	Naph. to VGO		"	0.75"	"	"
KF-742	Deep HDS	Naph. to VGO		Q	45	"	"
KF-746	"	FCC-PT, lube		"	0.61"	"	"
KF-752	Highest HDS act.	Diesel to VGO		"	47	"	"
KF-643	HDM/HDS	Resid		"	39	"	NiCoMo

Hydrotreating catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
KF-645	HDM of HVGO/DMO/DA	HVGO/DMO/DAO		"	36	"	CoMo	x
KF-801H	High HDS/HDM MHC	Naph. to VGO		Cyl.	47	"	NiCoMo	x
BASF								
M 8-24	Lube hydrofinishing	Raw lube feed	Lube, white oil	Cyl. ext.	0.72"	Al ₂ O ₃	NiO/MoO ₃	x
M 8-25	Wax HDT, paraffins	Slick wax	Food gr. paraffin	"	0.82"	"	"	x
H 1-80	White oil	Aro. hydrog.	Med. gr. wht. oil	"	1.0"	-P-	NiO	L
CATALYST & CHEMICALS INDUSTRIES CO. LTD.								
CDS-R2	High HDS, act.	Atm. & vac. resid.	Desulf. oil	Cyl.	0.68"	Al ₂ O ₃		x
CDS-R95	High HDS & demet. act.	"	"	"	0.66"	"		x
CDS-R25H	Superior high HDS act.	"	"	"	0.63"	"		x
ACTMAX	Superior high HDS act. & long life	Atm. resid.	"	"	0.66"	"		x
CDS-DN1	High demet.	Atm. & vac. resid.	Demetalized oil	"	0.58"	"		x
CDS-DM5	High demet. & HDS	"	"	"	0.62"	"		x
CDS-D9	High HDS activity	Naphtha, kero, gas oil	Desulf. kero., VGO	"	0.72"	"		x
CDS-D11	"	Kero., diesel VGO	Desulf. kero., diesel	"	0.73"	"		x
CDS-D13	Superior high HDS act.	"	VGO	"	0.78"	"		x
CDS-D15	"	"	"	"	0.73"	"		x
CDS-D21	" & long life	"	"	"	0.74"	"		x
CDS-DN1	High HDS/HDN activity	Naphtha	Desulf. naphtha	"	0.77"	"		x
CHEVRON RESEARCH & TECHNOLOGY CO.								
ICR 112	High HDS act., low H ₂ consumpt.	VGO, CGO	LSFO, FCC feed	Cyl.	48	-P-	-P-	L
ICR 114	High HDN activity	"	FCC feed	"	46	-P-	-P-	L
ICR 131	High activity resid HDS, carbon residue removal, HDM	DAO, topped crudes	LSFO, FCC feeds	Cyl. or Sh. ext.	38	-P-	-P-	L
ICR 135	"	atm., vac., resid.	coker feed	"	39	-P-	-P-	L
ICR 137	"	"	"	"	37	-P-	-P-	L
ICR 132	Resid HDM with high-activity HDS	"	"	"	33	-P-	-P-	L
ICR 122	Resid HDM	"	+ resid HDS feed	Sh. ext.	32	-P-	-P-	L
ICR 122LSE	Heavy loading resid HDM, continuous replacement	"	+ resid HDS feed	Sph.	29	-P-	-P-	L
ICR 133	Resid HDM	"	+ resid	"	33	-P-	-P-	L
ICR 401	Lube dewaxing	Semi-refined waxy lubes	Dewaxed lubes	Cyl.	42	-P-	-P-	L
ICR 403	Lube hydrofinishing	Semi-refined lubes, specialty oil product feeds	Lube base oils, industrial oils, specialty products	"	34	-P-	-P-	Contact Chevron
GC 101	High metals resistant	HDS, atm., vac. resid.	0.5-1.0% HFO	Cyl.	37	Al ₂ O ₃	-P-	L
GC 106	"	"	"	"	36	"	-P-	L
GC 102	High coke deact. resistant	"	0.2-0.6% S HFO	Cyl. Sh. ext.	40	"	-P-	L
GC 107	HDS cat.	"	resid, FCC feed prep	ext.	39	"	-P-	L
GC 100	High sev. resid HDS	"	0.05-0.2% S HFO	"	39	"	-P-	L
GC 105	"	"	"	"	37	"	-P-	L
GC 125	Metals resistant	High metals amt./vac. resid.	Demet./HDS	"	35	"	-P-	L
GC 130	"	"	"	"	32	"	-P-	L
GC 405	High act., hydrog., select. HC	Conventional refined	Lube, base oils	"	44	"	-P-	L
GC 36	High act. hydro., select. HC	Poor quality	"	"	52	SiO ₂ , Al ₂ O ₃	-P-	L
GC 30	Higher activity	Lube feed	"	"	55	"	-P-	L
GC 26	Selective hydrogenation	Semi-refined lube, specialty oil product feed	Lube indust. oils, specialty products	"	65	Al ₂ O ₃	-P-	L
CRITERION CATALYST CO. LP								
C-117	Front end resid	Resid	Resid demet	Cyl.	"P"	SiO ₂	-P-	x
C-127	Front end resid HDS	Heavy resid	"	"	44	Al ₂ O ₃	NiMo	x
C-214	Multipurp. HDT	Naphtha to HVGO	"	Sh. ext.	38	"	"	x
C-227	Tail end deep resid HDS	Moderate metals	"	Cyl.	44	"	"	x
C-311	Hydrocracker tail end	Hydrocracked feed	"	Sh. ext.	48	"	"	x
C-344	Hvy. duty HDS	Wide variety feeds	"	"	46	"	CoMo	x
C-424	High act. HDS, HDN	FCC feed	"	"	52	"	NiMo	x
C-444	High act. HDS	VGO/LGO/HGO cracked GOs	"	"	46	"	CoMo	x
C-448	Low-sulfur diesel	Mid. distillate/VGO	"	Sh. ext.	44	"	"	x
C-514	Support function, replaces inert material	All HDT applications, preferentially cracked feeds	"	Sph.	51	"	NiMo	x
C-544	"	"	"	"	51	"	CoMo	x
C-614, 624	Hydrog. of aromatics	Jet, kero., spec. oils	"	Cyl.	"P"	SiO ₂ /Al ₂ O ₃	Pt, PtPd	x
CDM-152	"	HGO thru resid	"	Sh. ext.	"P"	"P"	-P-	L
CSM-471	"	HGO thru resid	"	"	"P"	"P"	-P-	L
CSM-481, 482	"	HGO thru resid	"	"	"P"	"P"	-P-	L
GC-100, 101, 102	(See Chevron Research Hydrotreating listing)		L					
105, 106, 107	"							L
GC-405, 36, 30, 26	"							L
HC-B, HC-D	(See Unocal Hydrotreating listing)		L					
HC-F, HC-H	(See Unocal Hydrotreating listing)		L					
RF-11, RF-25	(See Unocal Hydrotreating listing)		L					
TRILOBE HDS-9		Naphtha/VGO		Sh. ext.	48	Al ₂ O ₃	NiMo	x

Hydrotreating catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
HDS-9		Naphtha/VGO		Cyl.	52	"	"	x
HDS-22		Fuel oil, FCC feed		Sh. ext.	43	"	CoMo	x
HDN-60		HGO/FCC feed/ HDT fuel oil		"	54	"	NiMo	x
HDS-1442	Ebullating bed	Resid		Cyl.	34	"	CoMo	x
HDS-1443	Ebullating bed	Resid		"	36	"	NiMo	x
HDS-2443	Ebullating bed	Resid		"	"p"	"p"	"p"	L
HDS-4443	Ebullating bed	Resid		"	"p"	"p"	"p"	L
N-21, 22, 23, 30	(See Unocal Hydrotreating listing)		L					
RC-400	Tail end resid HDS	Resid	Resid HDS	Sh. ext.	"p"	Al ₂ O ₃	CoMo	x
RC-410	Front end resid HDS	Resid	Resid demet	"	"p"	"	NiMo	x
RN-400	Tail end resid HDS	Resid	Resid HDS	"	"p"	"	"	x
RN-410	Front end resid HDS	Resid	Resid demet	"	"p"	"	"	x
Z-704A	(See Zeolyst Enterprises Hydrotreating listing)		L					
CROSFIELD CATALYSTS								
477	High HDS	Gas oils	Fuel oils, FCC fd.	Cyl.	44	Al ₂ O ₃	CoO/MoO ₃	x
479	Deep HDS, HDN, sat.	Hvy. GOs	"	"	50	"	"	x
497	High HDS	Gas oils	"	Katform	44	"	"	x
499	Deep HDS, HDN, sat.	Hvy. GOs	"	"	50	"	"	x
504K	High HDS, HDN, sat.	GO blends	"	Cyl.	51	"	NiO/MoO ₃	x
506	Deep HDS, HDN, sat.	GO & resid binds	"	"	57	"	"	x
594	High HDS, HDN, sat.	GO blends	"	Katform	51	"	"	x
535	High HDS, HDN, sat., low density	"	"	"	42	"	"	x
599	Deep HDS, HDN, sat.	"	"	"	57	"	"	x
KAT 4000	Ebullated bed HDS	Resid		Cyl.	34	"	CoO/MoO ₃	x
5000	"	"		"	34	"	NiO/MoO ₃	x
RT-2, -3	(See Exxon Research & Engineering hydrotreating listing)							
GC-101, 102, 106	(See Chevron Research & Technology Co. Hydrotreating listing)							
EXXON RESEARCH & ENGINEERING CO.								
RT-2	Contaminant toler. for resid	Atm./vac.	Diesel, LSFO			Tailored pore size	CoMo ₂	L
RT-228	proc., high act., regen.	vacuum/cracked	FCC feed prep.			"	Ni Mo	L
RT-621	"	GOs	Coking			"	CoMo	L
RT-3	"	"	FCC feed prep.			"	"	L
TN-6	"	"	LSFO			"	NiMo/CoMo	L
HALDOR TOPSOE								
TK-550	HDS	SR and crack. GO.		Rgn/cyl.	46	Al ₂ O ₃	CoMo	x
		VGO		"		"	"	
TK-551	HDS, HDN	"		"	49	"	NiMo	x
TK-525	HDS, extra HDN	"		Cyl.	47	"	"	x
TK-709	HDM/high stability	Atm./vac. resid		Ring	25	"	Mo	x
TK-711	"	"		Ring/Cyl.	44	"	NiMo	x
TK-751	HDS, HDM	"		Cyl.	44	"	"	x
TK-770	HDS	"		Ring/cyl.	46	"	CoMo	x
TK-771	"	"		"	49	"	NiMo	x
TK-871	Hydrocracking	"		Cyl.	—	Al ₂ O ₃ /zeolite	"	x
INSTITUTE OF CATALYSTS, NOVOSIBIRSK								
IC-12-72	High mechanical strength	Fluidized bed oxidation of H ₂ S to S	Sulfur	Sph.	1.1*	Al ₂ O ₃	Mg, Cr oxides	Contact Inst. of Catalysts
IC-12-74	Higher selectivity in H ₂ S to sulfur	the oxidation of	"	"	0.9*	"	Fe oxide	Contact Inst. of Catalysts
INSTITUTO MEXICANO DEL PETROLEO								
IMP-HDW-10	Zeolitic for dewax. lube oil salts	Wide range	Dewaxed lube	Cyl.	0.80*	Zeo. Al ₂ O ₃	Pt/zeo.	L
LEUNA-WERKE AG								
8196	Repl. ceram. mtl. by catalyst area reduction	DO, VGO	HDS fractions	Ring tab	0.80*	Al ₂ O ₃	NiO/MoO ₃	x
8201	HDS, HDN	Coker, visbreaker naphtha	"	Sph.	0.65*	"	"	x
8206	HDS	Mid. dist. vis-breaker naphtha	"	Vortex	0.70*	"	"	x
8207	HDS, HDN (DESUS process)	VGO	FCC feed	"	0.70*	"	"	x
8208	HDS, HDM (DESUS process)	SRGO, DO, VGO	HDS fractions	"	0.60*	" + SiO ₂	"	x
8211	HDS	Naphtha, kero.	"	Sph.	0.65*	Al ₂ O ₃	"	x
8221 S	HDS, HDN, PCA decomp.	VGO, deasphalting	Lube oils	Ext.	0.60*	Al ₂ O ₃ /SiO ₂	"	x
ORIENT CATALYST CO.								
HOP-601	HDM with high metal tolerance	Atm., vac. resid	DMO	Sh. ext.	"p"	Al ₂ O ₃	"p"	x
HOP-611	High HDM with HDS	"	and desulf. oil	Sh. & Cyl.	"p"	"	"p"	x
HOP-802	High HDS	"	Desulf. oil	"	"p"	"	"p"	x
HOP-811	High HDN with HDS	"	Desulf. & desulf. oil	"	"p"	"	"p"	x
HOP-412	Sup. high HDN/HDS	Nap., VGO, lube oil	Desulf. nap., VGO	Sh. Ext.	"p"	"	"p"	x
			lube base oil, FCC	"	"	"	"	
HOP-461	"	Nap., kero., GO, VGO	Desulf. nap., kero. GO, VGO	"	"p"	"	"p"	x
HOP-491	High HDS/HDN	"	"	"	"p"	"	"p"	x
PROCATALYSE								
HR 306C	HDS, HDN	Naphtha thru VGO		Cyl.		Al ₂ O ₃	CoMo	x
HT 308	HDT	Residues		"	0.67*	"	"	x
HR 346	HDS/HDN/aro. hydrogenation	Naphtha thru VGO	Desulf. N-free product	"	0.77*	"	NiMo	x
HR 348	"	"	S and N-free products	"	"	"	"	x
HR 360	Hydrotreating	Atm. GO, VGO		Ext.		Al ₂ O ₃	NiMo prom.	x

Hydrotreating catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, Support	Active agents	Availability
HR 354	HDS/HDN/aro. hydrogen.	Naphtha thru VGO	N-free product	Cyl.	"	"	NiW	x
HMC 841	HDT, HDM	GO/VGO/atm., vac		Sph.	"	"	NiMo	x
HMC 849	HDM	resid		"	"	"	"	x
HMC 845	HDT, HDM	"		"	"	"	"	x
Actisphere 923	Catalyst protection & support	Naphtha thru resid		"	"	"	NiMo/CoMo	x
UNOCAL CORP.								
N-30	High act., HDS	Virgin, cracked, dist.	Desulfurized naphthas, VGOs	Sh. ext. Cyl.	"P"	"P"	CoMo	L
N-100	"	"	"	"	"P"	"P"	"	L
N-23	"	"	"	"	"P"	"P"	"	L
N-22	HDS, HDN	"	Low S, N prods.	"	"P"	"P"	NiMo	L
N-21	"	"	"	"	"P"	"P"	"	L
N-108	Desulfurization catalyst, better than N-30 and N-100 for diesel HDS	Virgin and cracked gas oils	Low-Sulfur diesel fuel	Sh. ext.	"P"	"P"	"P"	L
HC-H	HDS, HDN	Virgin, cracked, dist.	HC, FCC Feed	"	"P"	"P"	NiMo	L
HC-K	"	dist naphthas, VGOs	"	"	"P"	"P"	"	L
HC-F	"	"	Dist. prods. HC/FCC	"	"P"	"P"	"	L
HC-D	"	"	feed	"	"P"	"P"	"	L
HC-B	"	"	"	"	"P"	"P"	"	L
HC-J	Desulfurization and denitrogenation, lower cost than HC-K or HC-H, but similar act. with selected feedstocks	Virgin and cracked and dist. and vacuum gas oils	Low-Sulfur diesel and vacuum gas oil, hydro-cracker feedstocks	"	"P"	"P"	NiMo	L
HC-DM	Demetalization of VGOs	Coker gas oils and heavy vacuum gas oils containing significant levels of Ni and V	Low-metals, low sulfur products	"	"P"	"P"	"P"	L
RF-11	HDS	Atm. resid., whole crudes	Fuel oil, FCC coker feed	Sh. ext.	"P"	"P"	"P"	L
RF-25	High act. bifunctional demet.	"	"	"	"P"	"P"	"P"	L
RF-100	HDS	"	"	"	"P"	"P"	"P"	L
RF-200	High act. bifunctional demet.	"	"	"	"P"	"P"	"P"	L
RF-220	"	"	"	"	"P"	"P"	"P"	L
RF-1000	Desulfurization of residue, more active than RF-11 and RF-100	Various residues, whole crudes	"	"	"P"	"P"	CoMo	L
RF-1100	Desulfurization of residue more active than RF-11 and RF-100, better than RF-1000 for N removal	"	"	"	"P"	"P"	NiMo	L
UOP								
RCD-5	Metals tolerance, HDS	Atm. or vac. resid.	LSFO, cracking, coker feed	Sph.	41	Al ₂ O ₃	CoMo	Contact UOP
RCD-5A	High act. for HDS, mod. metal	"	"	"	46	"	"	"
RCD-7	High act. for S and CCR removal	Demet. oil, DA resid.	LSFO, cracking feed	Cyl.	53	"	"	"
RCD-8	High metals toler., high demet. mod HDS act.	Atm., vac. resid.	LSFO cracking, coker feed	"	36	"P"	"P"	"
RCD-9	High metals toler., high demet., high HDS act.	DA resid.	"	"	37	"P"	"P"	"

Polymerization

INSTITUTO MEXICANO DEL PETROLERO								
IMP-TPC-1	Highly selective extrudate	Propylene	Propylene tetramer, high oct. gaso.	Cyl.	0.88* 0.91*	Kieselguhr	H ₃ PO ₄	L
IMP-TPC-1(+)	"	"	"	"	"	"	"	L
UNITED CATALYSTS INC.								
C84-01-01 & C-02-01	Particle size	Propylene, benzene, butenes	Cumene polygaso., higher olefins	Sph.	55	Diatomaceous earth	H ₃ PO ₄	x
C-3-01	Form, particle size	"	"	Ext.	"	"	"	x
C-03-02	"	"	"	"	"	"	"	x
UOP								
SPA-1	High act. & select. larger size chamber reactor	Propylene, butenes, pentenes, benzene, toluene	Petrochemicals, gaso., tetramer, cumene, cymene	Cyl.	58	SiO ₂	H ₃ PO ₄	Contact UOP
C-2	Small size for tubular reactor	"	"	"	"	"	"	"

Sulfur (elemental) recovery

ALCOA								
S-100 1/4"	Lower pressure drop	Claus feed	Withstands pressure drop due to coking & NH ₃ . All converters and sub-dew point tail gas processes.	Sph.	45	Activated Al ₂ O ₃	Activated Al ₂ O ₃	x

Sulfur (elemental) recovery—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
S-100 3/16"	Higher activity	Ref. or nat. gas	All converters & sub-dew pt. tail gas processes	Sph.	45	"	"	x
S-100 5/16"	Ext. low pressure drop	"	Withstands extreme coking & NH ₃	"	45	"	"	x
S-400 3/16"	Higher activity	Claus feed	Custom tailored pore structure. All converters and sub-dew pt. tailgas processes.	"	43	"	"	x
SP-400 3/16"	High COS & CO ₂ conversion	"	In first reactor, COS & CO ₂ conversion.	"	45	"	"P"	x
SRU 1/2" SRU 3/8"	Active bed supt., high physical strength	All Claus plants	High strength bed supt. and hold-down with Claus activity	"	50	"	Activated Al ₂ O ₃	x
ARI TECHNOLOGIES INC.								
ARI-310	Active ingredient in chelated aqueous solution	Ref. gas, SWS gas, amine tail gas, nat. gas	Elemental S	Liquid	74.8	None	Fe	L
ARI-340	"	"	"	"	77.9	"	"	L
CATALYST & CHEMICALS INDUSTRIES CO. LTD.								
CSR-2	High Claus activity	Claus react. feed	S	Sph.	0.84*	Al ₂ O ₃	"	x
CSR-3	High hydrolysis of org. sulfide	"	"	"	0.87*	"	"	x
CSR-7	High prevention of sulfation	"	"	"	0.80*	"	"	x
CRITERION CATALYST CO. LP								
S 949	High act. Claus, high COS/CS ₂ hydrolysis	"	S	Sph.	0.53*	SiO ₂	"	x
DISCOVERY CHEMICALS INC.								
DD-431 3/16"	High activity, high porosity, high SA	Sub-dew pt. Claus tail gas	Sulfur	Sph.	42	Al ₂ O ₃	Al ₂ O ₃	x
D-431 3/8"	Active bed support	Sub-dew-pt. bed support	"	"	43	"	"	x
ENGELHARD CORP.								
SuReCat 2-4, 3-6	High act., low attr. prom. Sr resist.	Gas w/2:1 H ₂ S:SO ₂	Purified gas, S	Sph.	50-52	Al ₂ O ₃	Al, Ti, Fe oxide	x
SRC 2-4, 4-8	High Claus activity. Higher than SRC 2-4 activity	"	"	Granules	53 55	"	"	x x
LPD 5-16	Modest activity, bed support	"	"	Ext.	52	"	"	x
LPD 5-8	Modest activity, bed support only	"	"	"	52	"	"	x
LA ROCHE CHEMICALS INC.								
S-201 3x6	Stand. high porosity	H ₂ S:SO ₂ :COS:CS ₂ S conv.	"	Sph.	45	Activated Al ₂ O ₃	Activated Al ₂ O ₃	x
S-201 1/2x1/4	"	"	"	"	"	"	"	x
S-201 5x8	Sub-dew pt. operation	H ₂ S:SO ₂ conv.	"	"	"	"	"	x
S-501 3x6	Promoted, sulfation resistant	Imp. COS:CS ₂ conv.	"	"	52	"	"	x
S-501 1/2x1/4	"	"	"	"	"	"	"	x
S-701	" + thermal stability	Very high CS ₂ :COS: H ₂ S conversion	"	Kloverleaf	52	"	"	x
LEUNA-WERKE AG								
6303	2nd and 3rd cat. stage	Claus feed	Sulfur	Sph.	0.50*	Al ₂ O ₃ /SiO ₂	Al ₂ O ₃ /SiO ₂	x
6304	1st cat. stage high COS/CS ₂ hydrolysis	"	"	"	"	"	Al ₂ O ₃ + prom.	x
6311	2nd & 3rd cat. stage (in comb. with 6303)	"	"	"	"	Al ₂ O ₃	Prom.	x
PROCATALYSE								
CR 4-6	High pore volume	H ₂ S	S	Sph.	0.67*	Al ₂ O ₃	"	x
DR 5-10	First generation Claus	"	"	"	0.75*	"	"	x
AM 4-6	Sulfation protection	"	"	"	"	"	Fe	x
CRS 21	High COS, & CS ₂ conv.	"	"	"	0.71*	"	TiO ₂	x
CRS 31	High COS/CS ₂ conv., unsulfatable	"	"	"	0.95*	TiO ₂	TiO ₂	x
CT 739	Catalytic incineration	H ₂ S & SO ₂	SO ₂	Cyl Sph.	0.60*	SiO ₂	Fe	x
UNOCAL CORP.								
Selectox-32	Solid for oxidation of H ₂ S to S	Ref. acid gas, nat. gas plants, or waste treatment plants.	S, no SO ₃	Cyl.	"P"	"P"	Non-noble metals	L
Selectox-33	"	"	"	"	"	"	"	L

Steam hydrocarbon reforming catalysts

BASF								
M 8-12	Hydrog. of organic S compounds	Nat. ref. gas/LPG, lt. naphtha	Steam reformer feed	Ext.	0.72*	Al ₂ O ₃	CoMo	x
M 8-21	"	High CO ₂	"	"	"	"	NiMo	x
R 5-10	Removal of H ₂ S	S-containing gas	"	"	1.2*	"	ZnO	x
R 10-20	Removal of chlorine	Cl-containing gas	"	"	0.80*	"	Promoted Ni	x
G 1-25	Steam ref. (gasification)	Nat. ref. gas	"	Sph. Rings	1.1-1.25*	"	Promoted Ni	x
G 1-25I	"	"	"	"	"	"	Promoted Ni	x
G 1-25S	" + high therm. stab.	"	"	"	0.95-1.1*	"	Promoted Ni	x
G 1-50	Steam ref. (gasification)	LPG/naphtha	"	"	1.1*	"	Ni alkylized spec. carrier	x

Steam hydrocarbon reforming catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc ^a	Carrier, support	Active agents	Availability
K 1-12/1	" (sec. reformer)	Nat. ref. gas	"	"	1.0*	"	Ni	x
K 1-26	"	"	"	"	1.1*	"	Ni	x
K 1-80	Autothermal steam reforming	"	Proc. gas tub. ref.	Tablets	"P"	"	Ni	L
K 6-10	High temp. shift conv.	Proc. gas, ex. stm. ref., partial oxid.	Proc. gas for H ₂ production	"	1.0*	"	Fe/Cr oxide	x
K 6-11	" (low S/C ratios)	"	"	"	1.1*	"	Prom. Fe/Cr ox	x
K 3-110	Low temp. shift conv.	Proc. gas ex. HTS	"	Tablets	1.15*	ZnO/Al ₂ O ₃	Cu	x
K 8-11	Shift conversion, H ₂ S-cont. gas	Proc. gas ex. partial oxidation	"	Ext. tabs	"P"	"P"	CoMo	x
DYCAT INTERNATIONAL								
Dycat 101	S removal	Nat. gas	"	Granules	0.50*	"	Carbon	x
Dycat 140	"	Gas, naphtha	S-free hydrocarbons	Sph	70	None	ZnO	x
Dycat 154	"	Hydrocarbon gases ^a	"	Ext.	70	"P"	"P"	x
Dycat 866	Autothermal reforming	Natural gas/refinery gas	"	Rings	68-70	Al ₂ O ₃	"P"	x
Dycat 812	Secondary reforming	Natural gas	"	"	78-80	"	Ni, La	x
Dycat 892	Steam reforming	Naphtha	"	"	68-70	"P"	"P"	x
Dycat 873	High act. steam reforming	Nat. ref. gas	H ₂ /CO/CO ₂	"	68-70	Al ₂ O ₃	Ni, La	x
Dycat 873F	"	LPG, refinery gas, lt. naphtha	"	Enhanced rings	64-66	"	"	x
Dycat 890	"	Naphtha, gas	"	Rings	68-70	"	"	x
Dycat 894	"	Natural gas/refinery gas	"	Rings	68-70	Al ₂ O ₃	Ni, La	x
Dycat 610	CO conversion	H ₂ S-containing gas	Partial oxidation	Ext.	38	"P"	Co, Mo	x
Dycat 504	High temp. shift conv.	Proc. gas, ex. stm. ref., part. ox.	Proc. gas, H ₂ prod.	Tablets	1.25*	"	Fe, Cr oxides	x
Dycat 804	Methanation	CO/CO ₂	"	Rings, Tablets	54-56	Refractory	"	x
Dycat 844	"	High C oxide gas	H ₂	"	0.70*	"	Ni, La	x
HALDOR TOPSOE								
HTZ-3	Fine desulfur. of steam ref. feed	CH ₄ /LPG/naphtha ref. gas	S-free hydrocarbs	Ext.	81	"	ZnO	x
HTZ-5	"	"	"	"	62	"	"	x
TK-250	HDS	Gas & naphtha	Deep HDS/stm. ref.	Rings	31	Al ₂ O ₃	CoMo	x
TK-251	"	"	"	"	"	"	NiMo	x
TK-450	"	Naphtha	"	Cyl.	32	"	CoMo	x
TK-451	"	"	"	"	"	"	NiMo	x
HIG-1	C ₁₂ absorption/H ₂ offgases	Downstrm. HDS	"	Ring	58	"	Al ₂ O ₃	x
RK-69	High act. stm. ref., alkali promoted	C ₁ -C ₄ HC. ref. gas	"	"	65-68	MgAl ₂ O ₄	Ni	x
RK-69-7H	"	"	"	7-hole ring	57-60	"	"	x
R-67	High act. stm. ref.	"	"	Ring	65-68	"	"	x
R-67-7H	"	"	"	7-hole ring	57-60	"	"	x
RKNR	"	CH ₄ /LPG/naph/lt/hvy. offgas	"	Rings	"	"	"	x
SK-12	High-temp. CO conv.	Stm. ref. effluent	2-3% CO gas	Cyl.	69	"	Fe/Cr oxides	x
SK-201	" + high act., no byprod. formation at low S/C ratio	"	"	"	"	"	"	x
KK-142	" + high act., even at low S/C ratio	"	"	"	75	"	Cu oxides	x
LSK	Low-temp. CO conv., regen. C ₁₂ resist.	HT-shift effluent	0.1-0.3% CO gas	"	66	"	Cu/Zn/Cr ox.	x
LK-801	Low-temp. CO conv., S-resistant	"	"	"	62	"	Cu/Zn/Al ox.	x
LK-821	" + high act., long life	"	"	"	62	"	"	x
PK-5	Methanation	H ₂ 2% CO + CO ₂ H ₂ w/o CO/CO ₂ /O ₂ contain contaminants	"	Rings	39	Al ₂ O ₃	Ni	x
ICI KATALCO								
41-6	HDS	Gas/naphtha	Sulfur hydrogenation	Ext.	0.67*	Al ₂ O ₃	CoMo	x
61-1	"	"	"	"	0.67*	"	NiMo	x
32-4	S removal	"	Sulfur-free gas	Sph.	1.0*	"	ZnO	x
59-3	Cl removal	"	Chloride-free gas	"	0.85*	Al ₂ O ₃	Alkali	x
23-1, 23-3	Steam reforming	Nat. Gas/Ref. Gases	Synthesis gas	Rings	66/75	"	Ni	x
23-4, 23-4m	"	"	"	4-hole rings	66	"	Ni	x
25 series	"	Hvy Nat. gas & LPGs	"	Rings and 4-hole rings	66	Ca, Al ₂ O ₃	NiK ₂ O	x
46-1	"	Naphtha	"	Rings	1.15*	"	NiK ₂ O	x
46-4	"	"	"	"	1.0*	"	Ni	x
46-9	"	Hvy Nat. gas & LPGs	"	"	66	"	NiK ₂ O	x
47-4	"	Light naphtha	"	4-hole rings	1.15*	"	NiK ₂ O	x
57-3	"	Nat. gas-ref. gas	"	Ring	1.0*	"	Ni	x
71-1	High-temp shift conv.	Synthesis gas	CO-free process gas	Tablets	79	"	Fe/Cr oxides	x
71-3	"	"	"	"	79	"	Fe/Cr/Cu oxides	x
53-1	Low-temp shift conv.	"	"	"	65	"	Cu/Zn/Al ₂ O ₃	x
83-2	"	"	"	"	69	"	Cu/Zn/Al ₂ O ₃	x
11-3	Methanation	"	CO ₂ -free H ₂	"	70	Ca, Al ₂ O ₃	Ni	x
11-4	"	"	"	"	75	"	Ni	x
LEUNA-WERKE AG								
8203	Hydrog. of organic S compounds to H ₂ S	Nat. gas, syn. gas	Stm. ref. feed	Ext.	0.65*	Al ₂ O ₃ /SiO ₂	NiMoO ₃	x
8203 HS	"	"	"	Ring ext.	0.50*	"	"	x
4013	" + removal of H ₂ S	"	"	Tab.	1.45*	ZnO	ZnO + prom.	x
4015	Removal of H ₂ S	"	"	"	1.30*	"	ZnO	x
4016	Removal of HCl + H ₂ S	"	S & Cl-free HC	"	1.20*	"	ZnO + prom.	x

Steam hydrocarbon reforming catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
1031	High temp. CO conv.	Proc. gas ex. stm. reformer, part. oxid.	Gas for H ₂ /NH ₃ prod.*	"	1.30*	"	Fe/Cr oxides	x
1963	Low temp. CO conv.	"	"	"	1.45*	"	Cu/Cr/Al/Zn ox	x
6540	Methanation, low temp.	"	"	"	1.05*	"	Ni, Ni/Cr ox	x
6542	" + higher temp. stab.	"	"	"	1.15*	"	Ni, Ni/Cr/Al oxides	x
6543	Higher temp. methanation	"	"	"	0.8*	Al ₂ O ₃	NiO	x
PROCATALYSE								
MT 15	CO methanation	"	Pure H ₂	Sph.	"	Al ₂ O ₃	Ni	x
UNITED CATALYSTS INC.								
C11-2, -25	Steam reforming	Nat. gas-C ₃ H ₈ feed H ₂ , 65-72%	"	Raschig rings	50-65#	Ca, Al ₂ O ₃	Ni	x
C11-9-01-04-06	Composition differs	"	"	Rings	70-95#	Refractory	"	x
C11-09 HGS	"	"	"	Wheels	70-	Al ₂ O ₃	"	x
G90A, B, C	"	"	"	Raschig rings	50-60#	"	"	x
G56A, B, H	"	"	"	"	55-60#	Ca, Al ₂ O ₃	"	x
G-91 HGS	High act., K promoted	"	"	Ring/whis	50	Refractory	"	x
C11-9-061	"	C ₂ H ₄ /naphtha	"	"	80-85#	"	"	x
C11-9-062	"	"	"	"	"	"	"	x
C11-N/C11-NK	" and split loading	"	"	"	"	Al ₂ O ₃	"	x
* Bulk density depends on size of rings and Ni content.								
C7-2	Desulf., metal content	NG steam ref. feed	S free streams	Ext.	70	Binder	ZnO	x
C7-4	"	"	"	"	80	"	"	x
G-72D	"	"	"	"	70	"	"	x
G-1	Conv. of S compounds to H ₂ S	NG streams	"	Tablets	"P"	"P"	"P"	x
C12-3-05	High temp. shift conv.	Proc. gas ex. reformer	CO-free gas	"	65	"	Fe/Cr	x
G3	"	"	"	"	70	"	"	x
C18 HC	Low temp. shift conv.	Process gas	"	"	80-85	"	Cu	x
C18 HCS	"	"	"	"	70-80	"	"	x
G66A	"	"	"	"	80	"	"	x
G66B	"	"	"	"	90/85	"	"	x
C13-3	Methanation (diff. form & metal content)	"	H ₂ w/o CO/CO ₂	"	65	Refractory	Ni	x
C13-4	"	"	"	Sph.	55	"	"	x
C13-5	"	"	"	"	60	"	"	x
C25-2-02	CO/H ₂ O shift, H ₂ S-containing gas	Proc. gas/part. ox	"	Ext. tab. Tablet	40-70	Al ₂ O ₃	Co/Mo	x
G65	Withstands elevated temp.	"	"	Ext. tab.	58(ex)60(T)	"	"	x
G65RS	Methanation	"	"	Ext. tab.	60	"	"	x
G87	"	"	"	Sph.	55	"	"	x
G87RS	"	"	"	"	"	"	"	x
C12-4-01	Promoted HTS	High-temperature shift conversion	CO-free gas	Tablet	65	"	FeCr	x

Sweetening catalysts

ARI TECHNOLOGIES								
ARI-100L	Slurry of act. metal	LPG, gaso	Mercox, Mercat/liq/liq	Liq. susp. liquid	"	None	"P"	x
ARI-100EXL	Solution of act. metal	"	"	"	"	"	"P"	x
ARI-120	Powder	LPG/gaso./Kero./jet	Mercox fixed bed	Powder	"	"	"P"	x
ARI-120L	Slurry of act. metal	"	"	Lq. slurry	"	"	"P"	x
INSTITUTO MEXICANO DEL PETROLEO								
IMP OM-1	Sweet. in homogenous phase	LPG, gaso	"	Powder	"	"	Co	L
IMP OM-2	Sweet. in heterogenous phase	Gas, turbine fuel	"	"	"	"	"	L
PROCATALYSE								
LCPS 30	Act. agent dissolved in water	LPG, gaso, jet	"	Liquid	"	"	"P"	x
UDOP								
MEROX FB	Active agent dispersed in water	Lt. nap. to diesel	Mercox, fixed bed	Lq. slurry	"	"	"P"	L
MEROX WS	"	C ₁ through LSR, gaso	Mercox, liq/liq	Liquid sol.	"	"	"P"	L
MEROX No. 10	Active agent supported on activated carbon	Lt. nap. to diesel	Mercox	Granular	"	Activated carbon	"P"	L
MEROX No. 8	"	"	"	"	"	"	"P"	"

Claus unit tail gas treatment catalysts

AKZO CHEMICALS INTERNATIONAL BV/NIPPON KETJEN (All catalysts available in off-site presulfided form)								
KF-124 LD-1/8"	Low density, rugged	Claus tail gas	"	Cyl.	38	Al ₂ O ₃	CoO/MoO ₃	x
KF-124 HD 3E	Rugged	"	"	"	48	"	"	x
KF 165-3E	"	"	"	"	0.81*	"	"	x
ALCOA								
S-100 1/8"	Sub-dew pt. Claus tail gas	Claus tail gas	Ideal pore structure to desorb sulfur	Sph.	45	"	None	x
S-400 3/16"	Custom tailored pore structure	"	"	"	43	Activated Al ₂ O ₃	"	x
ARI TECHNOLOGIES INC.								
ARI-310	Active ingredient in chelated aqueous solution	Claus tail gas, amine acid gas	Elemental S	Liquid	74.8	None	Fe	L
ARI-340	"	Ref. gas, SWS gas, amine tail gas, nat. gas	"	"	77.9	"	"	L
CRITERION CATALYST CO. LP								
C-099	Incon. of Claus, SCOT tail gas	Claus, SCOT tail gas	"	Sphere	49	Al ₂ O ₃	"P"	x

Claus unit tail gas treatment catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, Support	Active agents	Availability
C-234	Conv. of S compounds to H ₂ S	Claus tail gas		Sh. ext.	31	"	CoMo	x
C-534				Sphere	49	"	"	x
C-599	Support function, replaces inert material	Tail gas		"	34	"	"P"	x
N-25, N-39	(See Unocal Claus unit listing)							L
CROSFIELD CATALYSTS								
403	COS/CS ₂ conv., high stab.	Claus tail gas	H ₂ S to recycle	Cyl.	32	Al ₂ O ₃	CoO/MoO ₃	x
DISCOVERY CHEMICALS, INC.								
DD-431	High activity, high porosity, high SA	Claus plant catalyst	Sulfur	Sph.	42	Al ₂ O ₃	Al ₂ O ₃	x
DD-431	Active bed support	Claus pit	"	"	43	"	"	x
DD-831	Sulfation-resistant	bed sppt. catalyst	"	"	46	"	"P"	x
3/16"	Promoted	Claus plant	"	"				
LAROCHE CHEMICALS, INC.								
S-301 3x6	High porosity, low attrition	Sub-dew pt. Claus tail gas		Sph.	45	Activated Al ₂ O ₃	Activated Al ₂ O ₃	x
S-301 5x8				"	"	"	"	x
S-201 3x6	Std. high porosity alumina			"	"	"	"	x
S-201 5x8				"	"	"	"	x
S-701	Promoted sulfur recovery	High CS ₂ /COS conv.	TGCU process	Kloverleaf	52	"P"	"P"	x
LEUNA-WERKE AG								
6311	Removal of H ₂ S & SO ₂	Claus tail gas	S	Sph.	0.50*	Al ₂ O ₃	Prom.	x
PROCATALYSE								
TG 103	Tot. hydrog. of S compounds	Claus tail gas	H ₂ S	Sph.	0.75*	Al ₂ O ₃	CoMo	x
TG 105				"	"	"	"	x
A 2.5	Catalysts for Sulfreen	Claus effluent		"	0.77*	"	"	x
CRS 31	Oxidation of H ₂ S to S	"		Ext.	0.95*	TiO ₂	"	x
AM 2.5	Catalyst protection (Sulfreen)	"		Sph.	0.82*	Al ₂ O ₃	Fe	x
UNOCAL CORP.								
Selectox-33	Solid for oxidation of H ₂ S	Claus tail gas		Cyl.	"P"	"P"	Non-noble metals	L
Selectox-32	catalytic incineration of SO ₂	"		"	"P"	"P"	"	L
N-25	Hydro., hydrolysis of gas S compounds	"		"	"P"	"P"	"P"	L
N-39	"	"		"	"P"	"P"	"P"	L
N-239	"	"		"	"P"	"P"	CoMo	L
UNITED CATALYSTS INC.								
C29-2-02		Claus tail gas		Ext.	37	Al ₂ O ₃	CoMo	x
C29-2-03	Stabilized carrier (SC)	"		"	"	"	"	x
C29-2-04	SC + lower metals	"		"	"	"	"	x
N-239	(See Unocal Corp. Claus unit Listing)							
G-41P	COS hydrolysis	High CS ₂ /COS conv.		Ext.	34-38	Al ₂ O ₃	"P"	x

Other refining catalysts

AKZO CHEMICALS INC.								
K-25	Oct. improver, attr. resist.	High oct., high LPGHigh oct. gaso.	olefiniticity	Powder		SiO ₂ /Al ₂ O ₃	ZSM-5	x
BASF								
R 3-11	CO, O ₂ , and S removal	Ethylene	Polymer grade	Tab.	0.9*	CuO		x
R 3-12	COS, arsine removal	Propylene		"	1.15*	"P"	CuO, ZnO	x
O 3-14	Oxychlorination	Ethylene	Ethylene chloride	Ring	0.9*	"P"	CuCl ₂	x
O 4-80	NO _x removal	Nitric acid offgas	N ₂	Cyl. ext.	1.1*	Al ₂ O ₃	V ₂ O ₅	x
O 4-81	"	Indust. offgas	"	Ring	0.8*	TiO ₂	"	New
O 4-85	"	Offgases	"	Honeycomb	0.6*	"	"	x
S 6-25	Styrene	Ethylbenzene	Styrene	Cyl. ext.	1.1*	"	Fe, K oxides	New
BAYER AG								
K 2634	Hydro. & etherification, condensation, dehydrozation	Methanol & C ₆ cracked fraction, acetone	TAME MIBK	Beads	1.2*	Polystyrene DVB	Sulfonic acid groups, Pd	L
K 1491	Oligomerization	Isobutene	Di/tri-isobutene	Powder	1.3*	"	Sulfonic acid groups	L
BP								
CDW-12	Product of specialty/lube oils	Dist./Raffinate	High quality specialty, lube oils	Cyl.		Zeolite	Noble metal	L
CDW-14	Imp. low-temp. properties of mid-distillates	Kero., gas oils	Jet, kero., diesel, heating oils	"		"	"	L
FF-62	Lube oil/Color improvement	Solvent ref. lubes	Finished lubes	Sph.		"P"	"P"	L
CHEVRON RESEARCH & TECHNOLOGY CO.								
GC-500	Selective arsine removal	LI. HC gas	Arsine free feed	Cyl.	34	Al ₂ O ₃	"P"	L
GC-501	"	"	"	"	"	"	"P"	L
CRITERION CATALYST CO. LP								
C 538	CO/H ₂ O shift reactors	Treatment of syngas		Sph.	52	Al ₂ O ₃	CoMo	x
TSR-10	(See Unocal Other Refining Catalysts listing)							L
SOAR-100	(See Unocal Other Refining Catalysts listing)							L
ENGELHARD CORP.								
HZ-1	Gas oil cracking, Houdrflow TTC. HGO		Olefins, LPG, LCO	Ext.	0.95*	In situ zeo.	Zeo./No RE	x
HZ-PLUS	HZ-1 is octane catalyst High attrition resistant	"	"	"	"	"	"	x

Other refining catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
EMCAT-100	RE exchanged version, max. liq. yield, HCC, TOC xylenes +	HGO/toluene/mixed C ₃ transalky	LPG/gaso/LCO xylene, benzene	"	"	"	Zeo. RE exchanged	x
EMCAT-80 HZ-PLUS P	Lower activity version Prepromoted products for max. CO burning.	HGO " cracking	LPG/gaso/LCO " "	"	"	"	Zeo. No RE HZ-P, RE exch.	x x
EMCAT-100 P HRO-254	Vapor phase S removal	Naphtha reformer	S-feed naphtha	"	70	Al ₂ O ₃	Xeo RE exch. "P"	x x
Ni 3238	Liq. phase S removal	"	"	Cyl.	50	"	Ni	x
HALDOR TOPSOE								
HTZ-3	Fine desulf. of stm. ref. feed + low temp., low S	CH ₄ /LPG/naphtha. ref. gas	S-free hydrocarbs.	Ext.	81 62	"	ZnO	x x
TK-250	HDS	Gas & naphtha	Deep HDS, stm. ref.	Rings	31	Al ₂ O ₃	CoMo	x
TK-251	"	"	"	"	"	"	NiMo	x
TK-450	"	Naphtha	"	Cyl.	32	"	CoMo	x
TK-451	"	"	"	"	"	"	NiMo	x
HIG-1	C ₁₂ absorption/HC offgases	Downstrm. HDS	"	Rings	58	"	Al ₂ O ₃	x
RK-69	High-act. stm. ref. alkali promoted	C ₁ -C ₄ HCS. ref. gas	"	7-hole mg	65-68 57-60	MgAl ₂ O ₄	Ni	x x
R-67	High-act. stm. ref.	"	"	Rings	65-68	"	"	x
R-67-7H	"	"	"	7-hole mg	57-60	"	"	x
RKNR	"	CH ₄ /LPG/naph. / hvy. offgas	"	Rings	"	"	"	x
SK-12	High-temp. CO conversion + high act., no byprod. formation at low S/C ratio	Stm. ref. eff.	Gas w/2-3% CO	Cyl.	69	"	Fe/Cr oxides	x
SK-201	" + high act. even at low S/C ratio	"	"	"	75	"	Cu oxides	x
KK-142	"	"	"	"	"	"	"	x
LSK	Low-temp. CO conv., regen. chlorine resist	HT shift effluent	Gas w/0.1-0.3% CO	"	66	"	Zn, Cr oxides	x
LK-801	"	"	"	"	62	"	Cu,Zn,Al ox.	x
LK-821	" + high act. & long life	"	"	"	62	"	"	x
PK-5	Methanation	H ₂ w/o CO/CO ₂ up to 2% contaminants	"	Rings	39	Al ₂ O ₃	Ni	x
INSTITUTO MEXICANO DEL PETROLEO								
IMP-TPC-1	Cumene production	Benzene, propane	Cumene	Cyl.	0.86-0.95*	"	Fe,K, oxides	L
IMP-ES-1	Styrene production	Ethylbenzene water vapor	Styrene	"	1.0-1.4*	"	"	L
INTERCAT CORP.								
BCA-105	Selectively cracks hvy. cycle oil into LCO and gasoline	"	"	MS	"	Blend with FCC catalyst	"	x
CMP-112	Nickel passivation additive	FCC feeds	Reduces hydrogen production	Liquid	"	"	"P"	x
V-CAT	Vanadium demobilization additive	"	Selectively demobilizes vanadium	MS	"	"	"P"	x
PROCATALYSE								
RS 103	Oxidation of S compounds	S-H ₂ S/COS/CS ₂ /RSH	SO ₂	Sph.	"	Al ₂ O ₃	Metallic oxides	x
FF 62	Lube oil hydrofinishing	Extracted lube	Finished base oil	"	"	"	"	L
HR 346	Wax hydrotreating	Slack wax	Food grade wax	Cyl.	"	"	Ni-Mo	x
SOLVAY CATALYSTS GmbH								
DURABEAD series	Moving bed catalytic cracking (TCC and Houdrflow)	"	"	"	"	"	"	"
D 12	Premium selectivity	HGO, VGO	Maximum gaso. yield	Bead	0.9*	SiO ₂ /Al ₂ O ₃	USY/zeolite	L
D 12P	Promoted D12	"	"	"	"	"	USY/CO promoter	L
D 14	Oct. enhancement	"	High oct. plus C ₃ /C ₄ olefins	"	"	"	ZSM-5 zeolite	L
D 14P	Promoted D 14	"	"	"	"	"	ZSM-5/CO promoter	L
UNITED CATALYSTS, INC.								
C53-2-01	COS hydrolysis	FCC P-P gas	"	Ext.	28-32	Al ₂ O ₃	PTS	x
G-132	Arsine removal	"	"	Tab.	75-85	"	Cu	x
C28-1-01	S removal	Naphthas, cat. ref. feed	"	Ext.	45-50	"P"	"P"	x
TSR-11	(See Unocal "other" listing)	"	"	"	"	"	"	L
C125-1-01	HCl removal	H ₂ offgas cat. ref.	"	Ext.	47-53	Zn	Ca	x
G-92	"	"	"	Sph.	49-55	Al ₂ O ₃	Na	x
Catofin	Light paraffin dehydrogenation	Isobutane, propane	Isobutylene, propylene	Ext.	60	"	Cr	L
Catadiene	Olefin dehydrogenation	Butene	Butadiene	"	60	"	"	L
T-2525	Mercury, arsine removal	FCC gas, light olefins	Propylene, butylene	"	"	"	"P"	x
UNOCAL CORP.								
TSR-10	Trace S removal	Naphthas	Cat. ref. feed	Sh. ext.	"P"	"P"	"P"	L
TSR-11	"	"	"	"	"P"	"P"	"P"	L
SOAR-100	Arsenic removal	Shale oil, coal liq.	Low arsenic prod.	"	"P"	"P"	"P"	L
UOP								
TA-4	Transalkylation	Toluene and C ₆ aro. Benzene, xylenes	"	Cyl.	45	"P"	"P"	Contact UOP

Other refining catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft, g/cc*	Carrier, support	Active agents	Availability
DEH-5	Paraffin dehydrog.	C ₆ -C ₂₀ paraffins	C ₆ -C ₂₀ mono-olefins	-	21	Al ₂ O ₃	Pt	Contact
DEH-6	Lt. paraffin dehydrog.	C ₇ -C ₈ paraffins	C ₇ -C ₈ mono-olefins	-	-	-	"p"	UOP
DEH-7	Paraffin dehydrog.	C ₆ -C ₂₀ n-paraffins	C ₆ -C ₂₀ mono-olefins	-	20	-	"p"	-
A-2	Alkyl. of benzene w/ethylene	Ethylene, benzene	Ethylbenzene	-	35	-	"p"	-

Oxygenate catalysts

BAYER AG K2611	Etherification	Methanol/C ₄ raffinate	MTBE	Beads	1.2*	Polystyrene DVB	Sulfonic acid groups	L
ENGELHARD CORP. HPN IVB	Selective diolefin hydrogenation	Pretreatment C ₄	MTBE feedstock	Spheres	45	Al ₂ O ₃	Precious metal	L
HPN V		Pretreatment C ₄	TAME feedstock	Spheres	45	Al ₂ O ₃	Precious metal	L

Combustion promoters (FCC)

Catalyst designation	Primary distinguishing characteristics	Application	Additive to or component of catalyst	Form	Carrier, support	Active agents	Availability
AKZO CHEMICALS INC. KOC-15	High SA stability	CO combustion	-	Powder	SiO ₂ /Al ₂ O ₃	Pt	x
KOC-18	-	-	-	-	-	-	x
FILTROX A	Low activity	CO combustion	Additive	MS	SiO ₂ /Al ₂ O ₃	Pt	x
FILTROX C	Med. activity	-	-	-	-	-	x
FILTROX H	High activity	-	-	-	-	-	x
AMBUUR CHEMICAL CO. INC. CCA-1	Highest activity, bimetallic	CO combustion	Additive	MS	H ₂ Pur. Al ₂ O ₃	Pt, Pd	x
CCA-8	High activity, bimetallic	-	-	-	-	-	x
CCA-6	Medium act. bimetallic	-	-	-	-	-	x
CCA-850	Highest act. monometallic	-	-	-	-	Pt	x
CCA-700	High act. monometallic	-	-	-	-	-	x
CCA-500	Medium act. monometallic	-	-	-	-	-	x
CCA-350	Lower act. monometallic	-	-	-	-	-	x
CATALYSTS & CHEMICALS INDUSTRIES CO. LTD. SP-10S	Solid CO combustion promoter	FCC feed	Additive	Sph	Al ₂ O ₃	"P"	x
DAVISON CHEMICAL DIVISION, W. R. GRACE & CO. (Arranged in decreasing order of activity) CP-3	High activity	Partial comp. CO comb.	Additive	MS	-	"P"	x
CP-5	-	-	-	-	-	"P"	x
CPA	-	-	-	-	-	"P"	x
ENGELHARD CORP. COCAT-1	Low activity	Partial CO comb.	Additive	MS	SiO ₂ /Al ₂ O ₃	Prec. metal	x
COCAT-5	High activity	Full CO comb.	-	-	-	-	x
PROCAT 500	-	-	-	-	-	-	x
COCAT-7	High act., improv. support	-	-	-	-	-	x
PROCAT 700	-	-	-	-	-	-	x
INTERCAT CORP. COP-850	Pt content	CO combustion	Additive	MS	Al ₂ O ₃	Pt	x
COP-550	-	-	-	-	-	-	x
COP-375	-	-	-	-	-	-	x
KATALISTIKS INTERNATIONAL INC. KCP-8	High activity	Partial or full CO combustion	Additive or blend	MS	Alumina	Pt	x
KCP-5	Medium activity	-	-	-	-	-	x
UOP UNICAT CI-3	Active metal	CO combustion	Additive	Powder	Al ₂ O ₃ /SiO ₂	Pt	x

Sulfur oxides reduction catalysts (FCC)

Catalyst designation	Characteristics	Form	How introduced to FCC system
AKZO CHEMICALS INC. KDSOX	Low regeneration SO _x emissions, attrition resistance	Powder	Additive
CHEVRON RESEARCH & TECHNOLOGY CO. Transcat	Fully fluidizable powder	Added to FCC cat	Separate add. to FCC
DAVISON CHEMICAL DIV. W. R. GRACE & CO. (Arranged in decreasing order of activity) Sovtrap-520	Reduces regen. flue gas SO _x emissions	MS	Solid additive which can be added separately or pre-blended with FCC catalyst
Additive R	-	-	-
ENGELHARD CORP. ULTRASOX	Typical FCC particle	Typical FCC cat	As fresh makeup
MAGNASIV 370S	-	-	-
INTERCAT CORP. NO-SOX	Attrition resistant additive to control SO _x emissions	MS	Separate additive via Intercat additive feed system
LO-SOX Plus	-	-	-
KATALISTIKS INTERNATIONAL INC. DESOX	Removes SO _x from FCC flue gas, releases as H ₂ O	MS	Can be added separately to FCC system

Worldwide Construction

Lou Ann Thrash
Director of Editorial Surveys

Major construction projects in worldwide processing and pipelining, showing capacities, contractors, estimated costs, and time of completion. Total capacity figure in "Remarks & completion" column includes capacity of project listed.

Refineries — WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

Company and location	Project	Capacity (b/d)	Remarks & completion
UNITED STATES			
American International Petroleum Corp. — Lake Charles, La.	Vacuum Expan.	16,500	Expan.
	Expan.	50,000	Engineering stage.
	Cat. reformer	10,000	Contr. Chamberlain. 1991
	Hydrotreater	14,500	Pretreating cat. reformer feeds. Contr. Chamberlain. 1991.
	Isom.	4,500	C ₅ /C ₆ feed. Contr. Chamberlain. 1991.
Amoco Oil — Texas City, Tex.	Hydrogen	—	Recovery. Engr. Air Products. Contr. Brown & Root 1992.
	Deasphating	20,000	Resid. Engr. Kellogg. Contr. Brown & Root. 1992.
Whiting, Ind.	Hydrogen	—	Purification. 1992.
ARCO — Bellingham, Wash.	Hydrotreater	—	Diesel upgrade.
Ashland Petroleum — Catlettsburg, Ky.	Hydrotreater	40,000	Expan. SR dist. Process. Foster Wheeler. Sept.
	Cat. reformer	16,500	Expan. Fall 1993.
St. Paul, Minn.	Hydrotreater	20,000	Expan. SR dist. Process. Foster Wheeler. Sept. 1993.
	Hydrogen	9.0 MMc/d	Fall 1993.
BP Oil Co. — Toledo, Ohio	Platform	45,000	CCR unit.
Marcus Hook, Pa.	FCC	—	Expan. Lic/Engr. Stone & Webster. 1991.
cel2Cenex Farmers Union — Laurel, Mont.	Upgrade	—	CCR and hydrogen plant. Mid-1994.
Champion Refining & Chemicals Inc. — Corpus Christi, Tex.	Hydrotreater	56,000	Gas oil revamp. Late 1991.
Chevron U.S.A. Inc. — Richmond, Calif.	FCC	—	Revamp. Engr. Bechtel. April 1992.
Philadelphia, Pa.	Isom.	7,500	C ₄ feed. UOP. Feb. 1992.
Port Arthur, Tex.	FCC	—	Riser revamp. Lic/Engr. Stone & Webster. 1991.
Citro Petroleum Products Inc. — Albany, N.Y.	Cat. reformer	10,000	Planned. June 1992.
	Hydrocracker	4,000	Distillate upgrading planned. June 1992.
	Hydrotreater	15,000	Pretreating cat. reformer feed planned. June 1992.
	Hydrotreater	4,000	SR dist. planned. June 1992.
	Isom.	5,000	C ₅ /C ₆ feed. Planned. June 1992.

Company and location	Project	Capacity (b/d)	Remarks & completion
Citgo Petroleum Corp. — Lake Charles, La.	Hydrocracker	11,000	Revamp. 31,000 b/d total capacity. Contr. Lummus Crest. Late 1991.
Clark Oil & Refining — Blue Island, Ill.	Hydrotreater	8,000	SR dist. June 1993.
	Hydrotreater	4,000	Other dist.
	Hydrogen	3.0 MMc/d	Steam methane reforming. June 1993.
Hartford, Ill.	Hydrotreater	24,000	SR dist. expan. Engr. Kellogg. June 1993.
	Hydrotreater	10,000	Other dist. expan. Engr. Kellogg. June 1993.
	Hydrogen	8.0 MMc/d	Expan. steam methane reforming. Design. Kellogg. June 1993.
Coastal Chemical Inc. — Cheyenne, Wyo.	MTBE	4,000	2 nd Qtr. 1992.
Conoco — Billings, Mont.	Coker*	12,500	\$100 MM. Engr/Contr. Bechtel. 1992.
Ponca City, Okla.	Lube	—	Rebuild fire damage.
	Cat. cracker	20,000	FCC. Engr/Contr. Kellogg. 1991.
Crown Central Petroleum — Pasadena, Tex.	FCC	52,000	Revamp. Engr. Kellogg. 1991.
Diamond Shamrock R&M Co. — Three Rivers, Tex.	Hydrocracker	25,000	Engr. SIP. Contr. Zachry. 1993.
	Hydrotreater	20,000	1993.
	Crude	15,000	70,000 b/d total capacity. Engr/Contr. Staff. 1993.
	CCR	10,000	20,000 b/d total capacity. 1993.
Sunray, Tex.	Hydrotreater	25,000	Diesel. Engr/Contr. Staff. 1993.
Ergon Refining Inc. — Vicksburg, Miss.	Exp. in.	3,700	Crude. 1991.
	Vacuum	3,400	Expan. 1991.
	Hydrorefining.	2,700	Expan. Lube. 1992.
	Lube	2,300	Expan. oils. 1992.
	Asphalt	1,200	Straightrun Expan. 1991.
	Hydrogen	5.0 MMc/d	Steam methane expan. reforming. 1992.
Exxon U.S.A. — Baton Rouge, La.	MTBE	7,000	Contr. Jacobs Engr. End 1992.
Giant Refining Co. — Gallup, N.M.	Refinery	7,000	Expan. Design. Parsons. 1992.
Hill Petroleum Co. — Houston, Tex.	Alky. Isom.	4,000	Expan. Sulfuric acid. 1992.
		6,000	C ₅ /C ₆ feed. 1991.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
Koch Refining Co. — Corpus Christi, Tex.	Crude	120,000	250,000 b/d total capacity Summer 1993
Marathon—Robinson, Ill.	MTBE	1,700	Contr Kellogg, Dec. 1991
	Hydrotreater	60,000	Expan. Mtd distillate. Contr Kellogg, May 1993
	Cat. cracker	—	Expan. Lic/Engr. Stone & Webster, 1992
Detroit, Mich.	Hydrotreater	15,000	Revamp. Mid distillate. Contr Fluor Daniel, May 1993
	FCC	—	Expan. Engr. Stone & Webster, Contr Fluor, 1991
	Hydrotreater	—	Gas oil revamp. Contr Fluor, 1993
Texas City, Tex.	FCC	—	Expan. Lic/Engr. Stone & Webster, 1991
Mitsui & Co. —Deer Park, Tex.	MTBE	500,000	Lic. Lummus Crest
Mobil Oil Corp. — Beaumont, Tex.	Crude	40,000	Expan. 325,000 total capacity. Contr Kellogg, 3 rd Qtr 1992
	Coker	10,000	Delayed Coker. Expan. 3 rd Qtr 1992
	Cat. reformer	52,000	Expan. CCR Contr Kellogg, 3 rd Qtr 1992
	Hydrocracker	8,000	Expan. Dist. upgrading. Contr Kellogg, 3 rd Qtr 1992
	Hydrotreater	15,000	Expan. Pretreating cat. reformer feed. Contr Kellogg, 3 rd Qtr 1992
	Coke	770	Expan. Contr Kellogg, 3 rd Qtr 1992
Joliet, Ill.	Hydrotreater	50,000	Distillate. Contr Litwin, 1993
	Cat. reformer	44,000	CCR Contr Litwin, 1993
Murphy Oil USA Inc. — Meraux, La.	Hydrotreater	27,500	Diesel. Contr UOP, May 1993
	Asphalt	500	1991
National Cooperative Refinery Association — McPherson, Kan.	Cat. reformer	5,000	CCR Contr Litwin, April 1992
	Hydrotreater	4,000	Expan. Pretreating cat. reformer feed. Contr Litwin, April 1992
	Hydrotreater	30,000	Expan. SR dist. Aug. 1993
Navajo Refining Co. — Artesian, N.M.	CCR	12,000	Engr/Contr Fluor, 1991
Pacific Refining Co. — Hercules, Calif.	Cat. cracker	23,200	FCC unit. Lic. Stone & Webster, 1993
Phillips 66 Co. — Shell Oil Co. — Martinez, Calif.	Refinery	—	Revamp. Engr. stage Engr. Parsons, 1992
Wilmington, Calif.	Refinery	—	Revamp. Engr. stage Engr. Parsons, 1992
Norco, La.	Cat. cracker	90,000	Resid. unit. Engr. Foster Wheeler, Contr Kellogg, Mid-1992
Sinclair Oil Co. —Tulsa, Okla.	Hydrotreater	13,000	Expan. other distillates, 1993
Southwestern Refining Co.	Isom.	7,500	C ₅ /C ₆ , 1 st Qtr. 1992
	MTBE	1,800	Contr Brown & Root, Mid-1992
Star Enterprise— Convent, La.	Hydrotreater	25,000	Lic. IFP, Engr. Jacobs Eng. 1992
	FCC	85,000	Revamp. Engr. Kellogg, 1991

Company and location	Project	Capacity (b/d)	Remarks & completion
Port Arthur, Tex.	Coker	40,000	Delayed. Contr. Brown & Root, 1993.
	Hydrotreater	36,000	Gas, 1991.
	Hydrotreater	16,000	Contr. Bruun 1993.
Sun Refining & Marketing Co.— Philadelphia, Pa.	Hydrotreater	27,000	Gasoline. Engr. phase. Engr. Merchem.
Texaco Ref. & Mktg. Inc. — Bakersfield, Calif.	Crude	55,000	Expan. Contr. Bechtel, 1992.
	Coker	20,000	Expan. Contr. Bechtel, 1992.
	Hydrotreater	36,500	Tail gas. Contr. Fluor Daniels, July 1993.
	Hydrotreater	5,000	\$10 MM Expan. Engr/Contr. Bechtel, 1992.
El Dorado, Kan.	Hydrotreater	15,000	Distillate. Contr. Fluor/Cheme, April 1993.
	Hydrogen	8.0	Contr. KTI/Cheme, April 1993.
	Hydrotreater	38,000	MMcfd Tail gas. Contr. TPA/Cheme, Aug. 1992.
Anacortes, Wash.	Hydrotreater	32,120	Contr. Fluor, July 1993.
	Hydrogen	16.0	Contr. Fluor, July 1993.
	Amine	8,400	MMcfd Recovery. Contr. Fluor, July 1993.
	Nonene	3,500	Contr. Brown & Root/Braun, 1992.
Three B Oil Co. — Wickett, Tex.	Upgrade	6,000	Oil \$20 MM.
Total Petroleum Inc. — Ardmore, Okla.	Cat. cracker	30,000	Expan. and cycle stock feed pretreatment. Hydrotreater, Mid-1993.
	Hydrotreater	28,000	SR dist. revamp. Mid-1993.
Trifinery—Corpus Christi, Tex.	Crude	24,000	Expan. Contr. Vertech, 1992.
Union Carbide— Lemont, Ill.	Hydrogen	4.8	Engr. Howe-Baker, 1991.
Unocal— Arroyo Grande, Calif.	Refinery	—	Revamp. \$50 MM. Engr/Contr. Brown & Root, 1993.
Wilmington, Calif.	Cat. cracker	47,000	FCC. Engr/Contr. Kellogg, 1992.
	Hydrotreater	55,000	FCC feed. Engr. Parsons, Contr. Bechtel, Late 1993.
	Hydrogen	60.0	Engr. Parsons, Contr. Bechtel, Late 1993.
	Alky.	7,000	MMcfd Expan. Lic. Stratco, Engr. Fluor, 1993.
	FCC	—	Fractionation revamp. Engr/Contr. Fluor, 1993.
	Crude	—	revamp. of units. Engr/Contr. Fluor, 1993.
U.S. Oil & Refining Co. — Tacoma, Wash.	Hydrocracker	5,000	VGO type, 1992.
	Hydrogen	9	MMcfd Steam methane reforming, 1992.
Valero Refining Co. — Corpus Christi, Tex.	Cat. reformer	27,000	CCR, Contr. UOP/Fluor, 1 st Qtr. 1992.
	Hydrocracker	25,000	Gas oil dist. Contr. UOP/Fluor, 1 st Qtr. 1992.
	Hydrotreater	20,000	Pretreating cat. reformer feed. Contr. Fluor, 1 st Qtr. 1992.
	Hydrotreater	20,000	Naphtha trace sulfur. Contr. UOP/Fluor, 1 st Qtr. 1992.
	Aromatics	7,000	BT. Planning, 3 rd Qtr. 1993.
	MTBE	12,500	Expan. Lic. IFP, Contr. UOP/Huels, Planning, 1 st Qtr. 1993.
Witco Corp. —Bradford, Pa.	Hydrocracker	27,000	CCR, Contr. Fluor, 1992.
	Fractionator	—	Naphtha, 1991.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
ABU DHABI			
Abu Dhabi National Oil—Ruweis	Crude	160,000	Expan. 280,000 b/d total capacity. 1991-92.
	Hydrocracker	31,320	Revamp. Contr: Snamprogetti. 1991.
Umm Al Nar	Expan.	12,500	Crude. Contr: Snamprogetti. 1 st Qtr. 1992.
	Cat. reformer	3,100	Expan. Contr: Snamprogetti. 1 st Qtr. 1992.
	Hydrotreater	22,500	Distillate. Contr: Snamprogetti. 1 st Qtr. 1992.

ANGOLA

Cabinda Gulf Oil Co. Cabinda	Crude	10,000	Crude distillation unit. Engr: Howe-Baker. 1991.
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ALGERIA

Naftec—Skikda	Cat. reformer	30,000	J.O.C. C. Itch. Enr. 1992.
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ARGENTINA

Yacimientos Petroliferos Fiscales—La Plata	Cat. cracker		Engr/Contr: Davy McKee. 1991.
	Hydrotreater		Expan. Jet fuel. Contr: Astro Evangelista.

AUSTRALIA

Ampol Refineries Ltd.—Brisbane, Queensland	Cat. reformer	4,000	Expan. 19,000 total cap. Davy McKee. 1993.
B.P. Kwinana Refining—Kwinana	Hydrotreat	10,000	Expan. Distillate. Contr: Pritchard. March 1992.
Callex Refining—Kurnell	FCC		Expan. Lic: Stone & Webster. Engr: Davy McKee. 1992.
Mobil Oil Corp.—Adelaide	Isom.	9,500	C ₈ /C ₆
Shell Refining (Australia) Pty Ltd.—Geelong	Cat. cracker	39,000	Long residue. Design: Davy McKee. 4 th Qtr. 1992.
	Hydrotreater	17,700	Alkylation pretreat. Lic: IFP. 1991.
	Hydrefiner	16,200	Gas oil HDS. \$14 MM. Contr: Davy McKee. 1 st Qtr. 1994.

BANGLADESH

Eastern Refinery Ltd.—Patenga, Chittagong	Thermal	10,400	Visbreaking. Contr: Technip. 1991.
	Hydrocracker	1,180	Distillate upgrading. Contr: Technip. 1991.
	Hydrogen	1.0	Steam naphtha reforming. MMscfd. Contr: Technip. 1991.

BELGIUM

Fina Raffinaderij NV—Antwerpen	Platformer	45,000	Naphtha. Lic: UOP. CCR tech.
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BRAZIL

Petroleo Brasileiro SA—Araucária-Paraná	Hydrotreater	31,400	Gas oil dist. Lic: IFP. Staff. 1992.
	Hydrogen	28.0	Fuel gas. Staff. 1992.
		MMscfd	
Betim, MG	Coke	20,400	Delayed. Staff/Promon. 1991.

Company and location	Project	Capacity (b/d)	Remarks & completion
Campinas	Cat. cracker	40,000	FCC. under constr. Lic: Kellogg. 1991.
Canoas, RGS	Crude	113,200	Planning. Staff.
	Hydrotreater	25,100	SR Dist. Staff. 1992.
	Hydrogen	10.5	Steam Naphtha Reforming. Staff. 1992.
Capuava, SP	Distillation	38,000	Atmospheric. Revamp. In-house.
Cubatão, SP	Hydrotreater	31,500	Gas oil dist. Lic: IFP. Staff. 1991.
	Hydrogen	22.8	Fuel gas. Staff. 1991.
		MMscfd	
Duque de Caxias	Hydrotreater	31,500	Gas oil dist. Lic: IFP. Staff. 1992.
Mataripe	Vacuum	143,000	Dist. and atmospheric. Staff: A. Araujo. 1991.
Paulina	Delayed coker	20,400	Staff. 1992.
	FCC	47,100	82,500 total cap. Under const. Kellogg/Promon/Staff. 1991.
	Hydrotreater	62,900	Gas oil dist. Lic: IFP. Staff. Planned. 1992.
	Hydrogen	33.5	Fuel gas. Staff. 1992.
		MMscfd	Planned.
Porto Alegre	Hydrotreater	31,500	Gas oil dist. Planned. Lic: IFP. 1992.

BRUNEI

Brunei Shell Petroleum Co.—Seria	Cat. reformer	5,400	Contr: Mannesmann. Late 1991.
Kuala Belait	Cat. reformer		Contr: Edeleanu. 1991.

CANADA

Consumer's Cooperative Refineries Ltd.—Regina	Alky.	6,000	(H ₂ SO ₄) planned. 1992.
Dow Chemical—Fort Saskatchewan	Refinery	70,000	120 million. natural gas liquids fractionation plant.
Husky Oil Operations—Lloydminster	Hydrocracker	54,000	Heavy oil (HRI) and delayed coker (FW). \$1.3 billion. Sept. 1992.
Hydrogenal—Bécancour, Quebec	Hydrogen	2.5	MMscfd. Contr: KTI. 1991.
Suncor—Sarnia, Ontario	FCC	19,500	Resins unit. Replaces existing unit. Engr: Kellogg. 1994.
Turbo Resources Ltd.—Near Calgary	Upgrade		30,000 total capacity.

CHILE

Petrox S.A. Refinería de Petróleo—Talcahuano	Thermal	9,000	Delayed coking. Contr: Foster Wheeler.
	Cat. reformer	500	5,000 total cap. Semi bim-cat. UOP. 1991.
	Hydrotreater	9,000	Distillate.
Refinería de Petróleo Concon SA—Concon	Hydrocracker	8,400	Dist. upgrading Jan. 1993.

CHINA

China National Offshore Oil Corp./Royal Dutch Shell—Huzhou, Guangdong	Refinery	100,000	Studies underway. 1995.
China Petrochemical Corp.—Erlan, Inner Mongolia	Refinery	20,000	1991.
Golmud, Qinghai-Tibet	Refinery	20,000	\$88 MM. Mid-1995.
Huan, Fujian province	Refinery	350,000	1994.
Haikou Comprehensive Refinery Co.—Haikou, Hainan province	Refinery	115,000	1993.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
Sinopec—			
Huang Pu.....	HDT-reformer	40,200	Under const. Contr: CTIP.
Luoyang.....	Cat. reformer	17,600	Under const. Lic: IFP. 1991.
	Hydrotreater	17,600	Naphtha. Under const. Lic: IFP. 1991.
Shanghai Gao Qiao Petrochem—Shanghai.....	Hydrotreater	1,021	Wax. Lic: IFP/Total Contr: Technip 1991.
West Pacific Petrochemical Co. Ltd.—Dalian, Liaoning..	Refinery	100,000	2 nd half 1994.

CHINA, TAIWAN

Chinese Petroleum Corp.—			
Kaohsiung.....	Crude	91,700	Expan. Mid-1993.
	Cat. reformer	22,600	Residual. Mid-1991.
	Isom.	9,160	C ₅ /C ₆ Contr: Linde. Mid-1993.
	TAME	2,450	Lic. IFP Contr: CTCI Corp. Mid-1993.
Lin Yuan.....	TAME	2,450	Lic. IFP Contr: CTCI Corp. 1992.
Ta lin pu.....	Cat. reformer	30,000	Mid-1992 No. 5
	TAME	2,000	Linde. Mid-1993.
	Crude	100,000	Mid-1993.
	RDS #3	30,000	Mid-1993.
	Isom.	5,000	Linde. Mid-1993.
	Olefin	14,000	Conversion. Mid-1993.
	Alky.	1,600	Dimersol. Lic: IFP 1994.
	FCC	25,000	Resid. Lic: Kellogg. 1991.
Tao-yuan.....	Isom.	5,000	Mid-1992.
	Hydrotreater	31,000	Naphtha. Lic: IFP. 1994.
	Crude	64,200	Mid-1993.
	Cat. reformer	25,000	CCR. Contr: FW/CTCI. 1993.

COLOMBIA

Ecopetrol—			
Barrancabermeja.....	FCC	8,000	Expan. Engr. stage. Lic: IFP/Total. 1992.
Middle Magdalena.....	Refinery	75,000	Basic engr. stage. TPL 1996
Puerto Triunfo.....	Visbreaker	30,000	Engr. TPL. Contr: IFP. 1993.

COSTA RICA

Refinadora Costarricense de Petroleo—Puerto Limon.....	Crude	20,000	Contr: Dragados. 1992.
	Vacuum	1,600	Expan. Contr: Recope. 1992.
	Hydrotreater	2,500	Expan. Diesel. Lic: IFP. Contr: Dragados. 1992.

CZECHOSLOVAKIA

Kaucuk sp—Kralupy.....	Vacuum	26,700	1994.
	Thermal	9,800	Visbreaking 1994.
	Cat. reformer	13,600	1994.
	Hydrocracker	14,900	Distillate upgrading. 1994.
	Isom.	2,800	C ₅ /C ₆ feed 1994.
	Hydrogen	1.8	Steam methane reforming. MMcf/d 1994.
Korama Kolin—Kolin.....	Lubes	75,000	Engr/Contr: KTI/Technoex port. 1991.
Slovnaft sp—Bratislava.....	Isom.	7,250	C ₅ /C ₆ feed. Contr: Chisso. Feb. 1992.

DENMARK

Norske Shell—Sola.....	Expan.	...	TIP Kero Merox
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EGYPT

Alexandria Petroleum—			
(El-Mex) Alexandria.....	Lube	100	under study.
		mt/y	
Amerya Oil Refining Co.—			
Alexandria.....	Aromatics	900	Expan. planned.

Company and location	Project	Capacity (b/d)	Remarks & completion
El-Nasr Petro. Co.—			
Suez.....	Crude	51,600	Distillation unit. End 1992.

ETHIOPIA

Ethiopian Petroleum Corp.—			
Assab.....	Crude	6,500	Expan. 24,500 total cap. 1993.

FRANCE

BP France—Lavera.....	Hydrotreater	20,000	Design: Foster Wheeler. 1991.
Raffinerie des Flanders.....	Cat. reformer	...	Fractionating unit integrated with catalytic reformer. Contr: Heurtey Industries. 1991.
	Isom.	11,000	Contr: Foster Wheeler. 1991.
El France—Donges.....	Hydrotreater	17,000	Naphtha. Contr: IFP. 1993.
Mormant.....	Hydroisom	2,200	Methane.
Grandpuits.....	Hydrotreater	...	Gasoline hydrotreater unit. Contr: Heurtey Industries. 1991.
	Cat. reformer	...	Expan. 1991.
Esso SAF—Port Jerome.....	Alky.	4,700	Contr: Foster Wheeler. Spring 1993.
	Expan.	700	White oils. Contr: TPL. Dec. 1991.
Mobil Oil Francaise—			
Norte Dame de Gravenchon	Isom.	7,000	C ₅ /C ₆
Shell—Berre L'Etang.....	Lube	8,000	16,000 total capacity. Contr: Serete. 1991.
		mt/y	
Total—La Mede.....	Isom.	...	Summer 1993.
Provence.....	Isom.	...	Summer 1993.
Mardyck.....	Isom.	...	Summer 1993.

GERMANY

Beta Group—Wilhelmshaven..	Recommission	160,000	Refinery. Project mgmt: Badger. Late 1991.
Deutsche BP—			
Bavaria.....	Cat. cracker	...	Expan. 1993-94.
Huls AG—Marl.....	Hydrogen	1.6	\$21 MM. Uhde.
		MMcf/hr	
Industrieanlagen Imports.....	Expan.	24,000	Vacuum distillation. Contr: Toyo Engineering Corp. Dec. 1991.
OMW—Karlsruhe.....	Isom.	9,500	Engr: Lurgi. End 1991.
Ruhrhel—Scholven.....	Vacuum	40,800	Engr: Lurgi. Mid-1993.
	Cat. cracker	22,500	FCC. Engr: Lurgi. Mid-1993.
PCK AG—Schwedt.....	Refinery	...	Modernization. \$445 MM.

GHANA

Ghanaian Italian Petroleum			
CL—Tema.....	Modernizing	...	feasibility study.

GREECE

Motor Oil Hellas—			
Corinth.....	Cat. reformer	3,800	Lic: IFP/Total. 1991.
	Hydrotreater	5,300	Lic: IFP/Total. 1991.

HUNGARY

Dunai Koolajipari Vall—			
Szazhalombatta.....	Cat. reformer	12,000	Contr: Mannesmann. 1992.
	Hydrorefiner	29,000	1993.

INDIA

Cochin Refineries Ltd.—			
Kerala.....	Crude	40,000	130,000 total capacity. Late 1992.
Eastern Refinery Ltd.—			
Chittagong.....	Visbreaker	10,400	Contr: Mannesmann. 1991.
	Hydrocracker	1,180	Dist. upgrade. 1991.
	Hydrogen	1.0	Steam: naphtha reforming
		MMcf/d	1991.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
Hindustan Petroleum Corp.—Bombay	Hydrotreater	50,000	Engr. stage. 1993.
	Lube	150,000	Engr. stage. 1993.
	Vacuum	....	Engr. stage. Contr: KTI. 1991.
Mangalore	Refinery	120,000	Proposed. \$225 MM. Birlas 27%, Hindustan 26%.
Indian Oil Corp.—Digboi, Assam	Crude	2,100	Distillation modernization. \$85 MM. Sept. 1993.
	Cat. reformer	1,800	Lic: IFP. Aug. 1993.
Barauni, Bihar	Cat. reformer	6,400	Lic: IFP. Aug. 1993.
	Hydrotreater	6,400	Lic: IFP. Aug. 1993.
Gujarat	Vacuum	52,500	Expan. 111,500 total cap. Contr: Engineers India. Oct. 1992.
	Thermal	11,400	Visbreaking expan. 30,900 total cap. Lic: IFP. Contr: Engineers India. Oct. 1992.
	Hydrocracker	24,700	Distillate upgrading. Lic: Chevron. Contr: Engineers India. Oct. 1992.
	Hydrogen	47.8 MMcfd	Partial oxidation. Lic: Linde. Contr: Engineers India. Oct. 1992.
Haldia, West Bengal	Lubes	1,200	Expan. Contr: Engineers India. Feb. 1993.
Karnal	Refinery	120,000	\$1.1 billion 1992.
Madras Refineries Ltd.—Manali	Lubes	301	Additives plant. Joint venture with Chevron.
	Hydrocracker	25,000	Resid upgrade. Approved. Early 1992.

INDONESIA

Pertamina—Balikpapan	Hydrotreater	12,000	Gas oil. Lic: IFP. 1992.
Balongan, West Java	Refinery	125,000	Contr: Mitsui/JGC Corp./Foster Wheeler/BP Group. 1994.
Musi	FCC	20,500	Expan. Contr: JGC. 1993.

IRAN

National Iranian Oil Co.—Arak	Refinery	150,000	\$1.8 billion. Contr: TPL. Dec. 1992.
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IRAQ

Techcorp—Baghdad	Hydrotreater	11,000	C ₄ . Contr: IFP. 1993.
	MTBE	80,000	Contr: IFP. 1993.
Mussayyib	Hydrotreater	27,500	C ₃ . Contr: IFP. 1993.

ISRAEL

Oil Refineries Ltd.—Ashdod	Cat. cracker	20,000	Fluid. Feb. 1992.
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ITALY

Agip Raffinazione SpA—Sannazzaro	Hydrogen		Engr: CTIP.
	Hydrocracking	31,320	Contr: Snamprogetti. 1992.
Amonima Petroli Italiana SpA—Milazzo	Hydrotreater	20,000	Lic/Engr: Lummus Crest. 1995.
Esso Italiana—Augusta	Thermal	18,000	Dist. 1992.
ICIP—Mantova	Thermal	2,000	Engr. 1992.
	Hydrotreater	3,000	Dewax. 1992.
	Cat. reformer	....	Revamp. 1992.
IGI—Manfredonia	Hydrogen	0.8 MMscfd	1991.
Saras SpA—Sarroch	CCR	18,000	Expan. Planned 1992.
	Hydrocracker	100,000	Mild. Design/Contr: Snamprogetti. Late 1991.

Company and location	Project	Capacity (b/d)	Remarks & completion
	Cat. reformer	18,000	Expan. Pretreating, feeds hydrotreater. Planned. 1992.
	Isom.	15,000	C ₅ /C ₆ feed. Planned. 1993.
Sarpom—Trecate	FCC	8,000	Expan. 1992.
Tamoi—Cremona	Hydrotreater	15,000	Naphtha. 1993.

JAMAICA

Petrojam Ltd.—Kingston	Vacuum	12,350	14,250 total cap. 1992.
	FCC	7,200	1992.
	Polymer.	418.5	1992.

JAPAN

KOA Oil Co. Ltd.—Osaka	Hydrotreater	10,000	Expan. Contr: Howe-Baker. 1991.
Kyokuto Petroleum Industries Ltd.—Chigusaatgan, Ichihara, Chiba	Cat. cracker	20,000	Fluid. 1994.
	Hydrotreater	30,000	Expan. SR distillate. 1992.
	Alky.	3,000	Sulfuric acid. 1994.
	Expan.	2.5 MMcfd	PSA 1993.
Nippon Petroleum Refining Co.—Kudamatsu, Yamaguchi	Refinery	120,000	1997.
Negishi	Cat. cracker	30,000	FCC. 1992.
Showa Shell Sekiyu KK—Kawasaki	Cat. reformer	16,000	Lic: Merchem Co. Design: JGC.
Taiyo Oil Co. Ltd.—Yokohama	FCC	30,000	Resid. Engr: Stone & Webster. 1992.
Tohoku Oil Co.—Sendai	Alky.	4,500	Contr: Mitsubishi. Oct. 1992.
	Cat. cracker	25,000	FCC. Lic/Engr: Kellogg. Contr: Chiyoda Corp. 1992.

JORDAN

Jordan Petroleum Refinery—Zerka	Vacuum	7,300	Expan. 1992.
	Thermal	7,500	Visbreaking. 1992.
	Hydrocracker	1,200	Expan. 1992.

KOREA

Honam Oil—Ulsan	Crude	....	Revamp. Engr: Lummus Crest.
Kuk Dong Oil Co. Ltd.—Daesan	Expan.	100,000	Dec. 1992.
	Vacuum	20,000	Expan. Sept. 1992.
	Cat. reformer	20,000	Dec. 1992.
	Expan.	20,000	Naphtha Hydrotreater. Dec. 1992.
	Hydrotreater	12,000	Expan. Gas Oil. Dec. 1992.
	Lube	2,000	Expan. Sept. 1992.
	Asphalt	4,000	Expan. Sept. 1992.
Kyung-In Energy Co.—Inchon	Hydrotreater	25,000	Naphtha. Lic: IFP. Contr: Chiyoda Corp. 1992.
	Cat. reformer	25,000	CCR. Lic: IFP. Contr: Chiyoda Corp. 1992.
Lucky Petochemical—Yeocheon	Alky.	373	Hydroalkylation. Process design: HRI Inc. 1992.
Ssangyong Oil & Refining Co.—Onsan	Cat. reformer	30,000	Lic: IFP. Contr: Foster Wheeler. 1991.
	Hydrotreater	30,000	Naphtha. Lic: IFP. Contr: Foster Wheeler. 1991.
	Hydrotreater	28,000	LI. gas oil. Lic: IFP. Contr: Lucky Eng. 1991.
	Hydrotreater	12,000	Kerosene. Lic: IFP. Contr: Lucky Eng. 1991.
Yukong Ltd.—Ulsan	LPG	3,800	Engr. stage. Engr: Parsons. 1991.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
	LPG Sweet	10,000	Engr. stage. Engr. Parsons. 1991.
	Distiller	40,000	Product. Engr. stage. Engr. Parsons. 1991.
	Distiller	150,000	Crude. Engr. stage. Engr. Parsons. 1991.
	Reformer	30,000	Engr. stage. Engr. Parsons. 1991.
	Treater	5,000	Merox. Engr. stage. Engr. Parsons. 1991.
	Hydrotreater	15,000	Naphtha. Engr. stage. Engr. Parsons. 1991.
	Separator	25,000	Xylenes. Engr. stage. Engr. Parsons. 1991.

KUWAIT

Kuwait National Petroleum Co. — Mina Al-Ahmad	FCC	10,000	Revamp. Lic. UOP. on hold.
	Alky.	4,500	Sulfuric acid. on hold.
	MTBE	1,200	Lic. IFP. on hold.

LIBYA

National Oil Corp. — Sebha	Refinery	20,000	Contr. Compagnie Tecnica Internazionale Progetti SpA. Planned.
	Crude	20,000	Atmospheric distiller. Contr. CTCI Corp.
	Hydrotreater	6,200	Naphtha. Lic. IFP. Contr. CTCI Corp. 1992.
	Cat. reformer	4,500	Lic. IFP. Contr. CTCI Corp. 1992.
Tobruk	Hydrotreater	3,300	Naphtha. Lic. IFP. Engr. CTCI Corp. 1991.
	Cat. reformer	3,300	Lic. IFP. Engr. CTCI Corp. 1991.

MALAYSIA

Petroleum Nasional Bhd. — Malacca	Refinery	200,000	2 refineries. Planned.
MTBE Malaysia Sdn Bhd. — Kuantan	MTBE	300,000	Contr. IFP. 1992.
Shell Refining Co. — Port Dickson	Vacuum	27,000	4 th Qtr. 1994.
	Hydrocracker	25,000	4 th Qtr. 1994.
	Cat. reformer	25,000	4 th Qtr. 1994.

MEXICO

Petroleos Mexicanos			
Cadereyta, Nuevo Leon	Visbreaking	50,000	Under constr. 1992.
Salina Cruz	Visbreaking	50,000	Under constr. 1991.
	FCC	40,000	Under constr. Lic. Kellogg. 1991.
Tula, Hgo.	Hydrotreater	25,000	Distillates. under constr.
	Hydrotreater	36,000	Naphtha. under constr.
	Cat. reformer	30,000	Naphtha. under constr.

NETHERLANDS

Shell — Pernis	Hydrocracker		Engr. stage. 1992.
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PAKISTAN

Attock Refinery Ltd. — Rawalpindi	Crude	18,400	48,900 total cap. Howe-Baker. 1991.
	Cat. reformer	10,000	Planned.
National Iranian Oil Co. — Port Gasin, near Karachi	Refinery	120,000	\$590 MM. 1996.
National Refinery Ltd. — Karachi	Cat. reformer	3,610	Expan. Bimetallic catalyst.

PAPUA NEW GUINEA

Chevron Niugini pty. Ltd.	Crude	1,500	Distillation unit. Engr. Howe-Baker. Contr. Bechtel. 1991.
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Company and location	Project	Capacity (b/d)	Remarks & completion
PERU			
Petroleos del Peru — Iquitos	Vacuum	1,620	Planning.
	Cat. reformer	1,620	Planning.
La Pampilla	Vacuum	33,000	Design: UOP. \$280 MM. 1994.
	Visbreaker	33,000	Design: UOP. 1994.
	FCC	15,000	Design: UOP. 1994.
Talara	Revamp	13,000	Crude. 75,000 total cap. 1993.
	Vacuum	22,200	43,800 total cap. 1993.
	FCC	6,400	23,000 total cap. 1993.

PHILIPPINES

Caltex (Philippines) Inc. — San Pascual, Batangas	Crude	18,000	Expan. Dec. 1993.
	Vacuum	1,900	Expan. Nov. 1991.
	Cat. cracker	1,900	Expan. Dec. 1995.
	Cat. reformer	2,900	Expan. Dec. 1993.
	Hydrotreater	2,800	Expan. Dec. 1993.
Philippinas Shell Petroleum Corp. — Tabangao, Batangas	Refinery	38,000	1994.

PORTUGAL

Neste Oy — Sines	MTBE	1,100	Contr. Tecnicas. 1992.
Petrogal — Porto	Hydrotreater		Revamp. Contr. Foster Wheeler. 1991.
	Hydrotreater		Solvent deasphalting revamp. Contr. Foster Wheeler. 1991.
Sines	Cat. reformer	35,000	FCC. Planned.
	Visbreaker	26,000	Planned.
	Vacuum	45,000	Distillation. Planned.

POLAND

Mazovan Refinery & Petrochemical Works — Plock	Platformer	18,264	CCR. UOP process. 1992.
	Cat. reformer	18,264	Expan. Pretreating. feeds hydrotreater.
	Hydrotreater	20,151	Expan. Dist.
Petroleum Refinery Gdansk — Gdansk	Crude	70,000	Expan. Planned.
	Cat. reformer	14,000	CCR. 1992.
	Hydrotreater	1,000	Dewaxing. 1995.

PORTUGAL

Petrogal — Sines	Cat. cracker	35,000	Contr. Technip.
	Visbreaker	26,000	Contr. Technip.
	Vacuum	45,000	Distillation unit. Contr. Technip.
	Merox		Two. Contr. Technip.

PUERTO RICO

Caribbean Petroleum Corp. — Bayamon	Modernize	42,000	\$25 Million.
Puerto Rico Sun Oil Co. — Yabucca	Hydrotreater	17,000	Heavy gas oil. 1992.
	Solvent	22,000	Extraction. 1992.

QATAR

National Oil Distribution Co. — Umm Said	Isom.	5,500	Contr. Technip. Late 1992.
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SAUDI ARABIA

Al Sultan Trading & Const. and Haji Hashi Muhammad Hashi Co. — Near Mogadishu	Refinery	200,000	prefeasibility study.
Petromin-Mobil — Yanbu	MTBE	10,000	Lic. ARCO. 1992.
Saudi Arabian Oil Co. — Ras Tanura	Refinery		Upgrade. Contr. Brown & Root.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
SINGAPORE			
Agip Petroli SpA.—Jurong Port	Lubes	612	Blending. Engr: CTIP.
BP Refinery Singapore Pl.—Pasir Panjang	Hydrocracker	14,000	Contr: JGC. 1992.
	Crude	130,000	Distillate unit. Contr: JGC. 1991.
Mobil Oil Singapore Pte Ltd.—Jurong	Cat. reform	....	Contr: Badger. 3 rd Qtr. 1993.

SOUTH AFRICA			
Gencor Group—Durban	Expan.	....	\$265 MM. 3 rd Qtr. 1992.

SPAIN			
Cepsa—San Roque	Cat. reformer	35,000	\$65 MM. Lic: UOP. CCR Platforming process. Late 1991.
Ertol SA—Huelva	Cat. cracker	12,500	FCC. Contr: Foster Wheeler. 1992.
	Hydrotreater	1,500	Expan. 1991.
	MTBE	655	Contr: Foster Wheeler. 1992.
Indian Additives Ltd.—Manali	Lube plant	301	Joint venture with Madras Refineries Ltd. and Chevron Chemical Co.
Petromed—Castellon	Cat. reformer	2,300	Expan. 1991.
Petronor—Bilbao	Modernize	....	\$90 MM.
Somorrosto	Alky	5,300	\$45 MM. Contr: Tecnicas. 1992.
Repsol Petroleo—Puertollano	Alky.	3,650	\$35 MM. Contr: Tecnicas. Late 1991.
Tarragona	Cat. Reformer	24,000	CCR. Contr: Tecnicas. Late 1992.
	Hydrotreater	1,722	Distillate. Contr: Tecnicas Reunidas. Mid-1992.

SRI LANKA			
Ceylon Petroleum Corp.—Sapugaskanda	Vacuum	1,100	Expan.
	Cat. reformer	1,125	Expan. 1994.
	Cat. reformer	1,900	Expan. Pretreating feed hydrotreating. 1991.
	Asphalt	625	Expan.

SWEDEN			
Skandinaviska Raff. Scanraff—Lysekil	FCC	33,500	Expan. Engr: Foster Wheeler. Oct. 1994.

TANZANIA			
Tanzania Petroleum Development Corp.—Dar-Es-Salaam	Vacuum	....	Distillation. Design/Engr/Contr: Snamprogetti. 1991.
	Bitumen	600	Design/Engr/Contr: Snamprogetti. 1991.

THAILAND			
Bangchak Petroleum—Bangkok	Crude	20,000	Modernizes* Dist. unit. 40,000 total capacity. \$80 MM. Contr: Chiyoda Corp.
Royal Dutch/Shell Group—Mab Ta Phud, Rayong province	Refinery	145,000	1994.
Thai Oil Co. Ltd.—Chonburi	Crude dist.	100,000	Unlicensed. 1992.
	Hydrotreater	29,000	Naphtha. UOP. 1992.
	Platformer	22,000	CCR. UOP. 1992.
	Merox	18,000	Kerosine. UOP. 1992.
	LPG unit	....	Unlicensed. 1992.

Company and location	Project	Capacity (b/d)	Remarks & completion
TRINIDAD			
Sriracha	Crude	93,000	Expan. Distillation capacity. Contr: Foster Wheeler. 3 rd Qtr. 1992.
	Kero Merox	17,200	3 rd Qtr. 1992.
	Hydrotreater	32,500	Naphtha. Minus. 3 rd Qtr. 1992.
	Cat. reformer	23,500	CCR. 3 rd Qtr. 1992.

TURKEY			
Trinidad & Tobago Oil Co. Ltd.—Pointe-a-Pierre	Refinery	116,000	Upgrading to double capacity. 1994.

TURKEY			
Turkish Petroleum Refining—Aliaga-Izmir	Vacuum	42,000	Expan. Contr: Snamprogetti/Tekfen. 1993.
	Thermal	19,000	Visbreaker. Lic: Lummus Crest BV. Contr: Snamprogetti/Tekfen. 1993.
	Hydrocracker	16,500	Dist. upgrade. Lic: UOP. Contr: Snamprogetti/Tekfen. 1993.
	Hydrogen	34.0	Steam naphtha reform. Contr: Snamprogetti/Tekfen. 1993.
	Hydrocracker	23,000	Distillate upgrading. 1994.
	Isom	5,000	C ₃ /C ₄ feed. Lic: UOP/Union Carbide. 1992.
	Hydrogen	50.0	Lic: UOP. 1994.
	Cat. reformer	14,000	CCR conversion. Lic: UOP. 1994.
	Upgrade	145,000	2 Crude/Vacuum units. Design: Parsons.
Kırıkkale, Ankara	Hydrocracker	14,500	Lic: UOP. Contr: JGC. 1992.
	Isom	9,020	Lic: UOP. 1993.
	Hydrogen	21.0	Contr: JGC. Lic: UOP. 1993.

UNITED KINGDOM			
BP Oil Grangemouth Refinery Ltd.—Grangemouth	Hydrocracker	35,000	Distillate upgrading.
Eastham Refinery Ltd.—Ellesmere Port	Crude	18,000	Expan.
	Vacuum	15,750	
	SR asphalt	12,000	
Elf Oil Ltd.—Milford Haven	Isom.	7,500	Naphtha. 3 rd Qtr. 1992.
Esso Petroleum Co.—Fawley	Expan.	....	Resid. upgrader. Seeking new bids.
Mobil Oil—Coryton	Crude	152,000	
	FCC	52,000	
	Isom.	13,500	Contr: Foster Wheeler.
Teeside	Upgrade	....	Engineering stage. Contr: Davy McKee. 1991.
Phillips Petroleum—Teeside	Upgrade	....	Engr: Davy McKee. Feb. 1992.
Shell UK Ltd.—Shell Haven	Naphtha	58,000	Minus complex. Expan. Contr: Davy McKee. 2 nd Qtr. 1992.
	Isom	22,000	2 nd Qtr. 1992.
Texaco Ltd.—Pembroke	Isom.	10,600	Naphtha. Contr: Kellogg.

URUGUAY			
ANCAP—La Teja Montevideo	Vacuum	40,000	Revamp. Contr: Techint. 1994.
	Visbreaker	7,000	Revamp. Engr: Foster Wheeler. Contr: IFP. 1994.
	Cat. cracker	9,000	Resid. 1994.
	Crude	40,000	Revamp. Crude topping unit. 1994.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
U.S.S.R.			
Bashkirdkiy Neftekhimskiy Zavod—Novo-ovlimik	Cat. reformer	20,450	CCR Lic. IFP 1991
	Hydrotreater	40,845	Gas oil Lic. IFP 1992
Ufa	Hydrotreater	30,635	Naphtha Lic. IFP 1991
	Cat. reformer	20,425	CCR Lic. IFP 1991
	Isom.	20,425	Lic. IFP 1991
VENEZUELA			
Corpoven SA—El Palito	MTBE/TAME		Lic/Engr: Intevep Engr: stage \$11MM. 1993
Puerto La Cruz	Alky	900	Expan. Lic. Phillips Engr: C.F. Braun/Ineletra Contr: Rivaco. Total capacity 4,100 b/d \$16 MM. 1991
	Refinery	340,000	Heavy crude oil. Planning stage \$321 MM. 1997
Lagoven SA—Amuay	MTBE/TAME	1,400	\$31MM. Eng. stage. Lic/Engr: Intevep. 1992
	Coker	29,000	Delayed. Engr: Foster Wheeler Contr: Technoflor. \$210 MM. 1993
	Hydrotreater	1,500	C ₄ Lic. IFP Engr/Contr: Staff \$5 MM. 1992
Maraven SA—Cardon	MTBE/TAME		Lic/Engr: Intevep Engr: stage \$53 MM. 1992
	Cat. craker	14,000	Expan. FCC. Total cap. 75,000. Lic. SIPM Engr: Jantesa \$19 MM. 2 nd Qtr. 1992

Company and location	Project	Capacity (b/d)	Remarks & completion
	Hydrotreater	6,500	Lic: Merichem. Engr: Jantesa. Contr: Conteca. \$6 MM. 1991
	Hydrotreater	60,000	Naphtha. \$74 MM. 1995.
	Coker	60,000	Engr: Foster Wheeler. \$108 MM. 1995.
	Cat. reformer	45,000	Lic/Engr: UOP. \$110 MM. 1995.
	Isom.	15,000	Naphtha. Lic/Engr: UOP. \$52 MM. 1995.
Refinera Isla—Curacao	Hydrotreater	3,000	Jet fuel. Lic: Menchem. Contr: Brown & Root. \$4.6 MM. 1992
	Isom.	650	Naphtha. Lic: UOP. Engr: Brown & Root. \$11.2 MM. 1992
VIET NAM			
Government	Refinery	60,000	Engineers India Ltd. Feasibility study.
YUGOSLAVIA			
Rafinerija Nafta Rijeka—Rijeka	Vistbreaker	10,400	Contr: Technip. 1991.
	Hydrocracker	12,253	Mild. Lic: IFP. Contr: Technip. 1992.
Rafin. Nafta Pancevo—Pancevo	Cat. reformer	17,800	Semi. bimcat. UOP. 1995.
	Hydrotreater	25,500	34,300 total cap. UOP. 1995.

Petrochemicals—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

AIR PRODUCTS. Deer Park, Tex. Polyvinyl alcohol plant under construction. Engr/Contr: Bechtel. Completion: 1991.

AMOCO CHEMICAL Co. Chocolate Bayou, Alvin, Tex. 300 million lb/y polypropylene plant in the engineering stage. Contr: John Brown. Completion: 1992.

*No. 2 Olefins debottlenecking. Completion: 1994.

*500 MM lbs/y ethylene expansion in the engineering stage. Lic/Engr: Stone & Webster. Completion: 1994.

Cedar Bayou, Tex. polypropylene modernization. Engr: S&B Engr.

Joliet, Ill. purified isophthalate acid expansion to 200 MM lb/y. Completion: 2nd Qtr. 1992.

Texas City, Tex. 1.5 billion lb/y ethylene expansion in the engineering stage. Lic/Engr: Kellogg. Completion: 1992.

ARCO CHEMICAL. Channelview, Tex. 500 MM lb/y Propylene oxide and 1.25 billion lb/y styrene monomer expansion under construction. \$400 MM. Contr: HB Zachry. Completion: 1992.

Polyols expansion under construction. Design/Engr: John Brown. Completion: 1991

BETHLEHEM STEEL. Sparrow Point, Md. 4,900 mt/y modified claus unit in the engineering stage. Contr: Still Otto GmbH.

BORDEN CHEMICAL. Louisville, Ky. Phenolic resin plant in the engineering stage. Contr: John Brown. Completion: 1991.

CF INDUSTRIES Inc. Donaldsonville, La. 1,100 t/d urea plant under construction. Engr/Contr: Kellogg. Completion: Mid-1993.

CHEVRON CHEMICAL. Orange, Tex. 127,000 mt/y expansion of hd polyethylene plant under construction. Contr: Brown & Root-Braun. Completion: 1991.

CHEVRON U.S.A. Beaumont, Tex. hd polyethylene in the engineering stage. Engr: John Brown. Completion: 1991.

COASTAL CHEMICAL Inc. Cheyenne, Wyo. 3,000 mt/y MTBE plant under construction. \$72 MM. Contr: Davy McKee. Completion: Oct. 1992.

COMBUSTION ENGINEERING Inc. Niles, Ohio WSA-SNO, plant under construction. Design/Engr: Snamprogetti. Completion: 1993.

COSMAR Inc. Freeport, Tex. 230,000 t/y aromatics plant in the engineering stage. Engr: Krupp Koppers. Completion: 1992

Gulf Coast. 1,000 MM lb/d styrene monomer plant. Completion: 1993.

DOW CHEMICAL. Freeport, Tex. 260,000 mt/y benzene plant in the engineering stage. Contr: Krupp Kopper. Completion: 1994.

DUPONT. Orange, Tex. ethyl-

ene expansion in the engineering stage. Engr: Lummus Crest. Completion: 1991.

EASTMAN. Longview, Tex. 100,000 mt/y polypropylene plant. Completion: 1991.

ENICHEM ELASTOMERS AMERICAS, Inc. Baytown, Tex. specialized polymer plant in the engineering stage. Contr: John Brown. Completion: 1992.

EPSILON. Marcus Hook, Pa. 120,000 t/y polypropylene plant. Completion: 1991.

FARMLAND INDUSTRIES. Pollock, La. Installation of ammonia optimizer under construction. Lic/Engr/Contr: Kellogg.

FORMOSA PLASTICS CORP. U.S.A. Point Comfort, Tex. 750,000 t/y ethylene plant, derivative units, and related facilities under construction. Lic: Kellogg. Completion: 1992.

300,000 t/y ethylene glycol plant in the engineering stage. Lic: Scientific Design. Engr: H-R

PETROCHEMICAL

International. Completion: 1991.
130,000 t/y polypropylene plant. Completion: 1991.

Pasadena, Tex. 71,200 t/y phenol expansion and 42,700 t/y acetone expansion. Feed: Cumene. \$36 MM. Planned.

GOODYEAR, Beaumont, Tex. specialty polymers expansion in the engineering stage. Engr: John Brown. Completion: 1991.

HUNTSMAN CHEMICAL Corp. Belpre, Ohio 32,000 t/y polystyrene expansion. Contr: Lummus Crest.

Woodbury, N.J. 150,000 t/y polypropylene plant. Completion: 1992.

LYONDELL PETROCHEMICAL Co. Channelview, Tex. increase capacity of flexibility unit to a total of 980 million lbs/y propylene. Engr: Lummus. Completion: 1st Qtr. 1993.

MELAMINE CHEMICALS, Donaldsonville, La. 30 MM lb/y melamine plant. Feed: Urea.

MTSUI & Co. (U.S.A.) Inc. Deer Park, Tex. 12,500 b/d MTBE plant in the engineering stage. Lic: Lummus Crest. Engr/Contr: Kellogg. Completion: Early 1992.

MOBIL CHEMICAL, Pasadena, Tex. olefins plant expansion under construction. Contr: Fish. Completion: 1991.

OCCIDENTAL CHEMICAL, Pasadena, Tex. 1 billion lb/y olefins unit at either Corpus Christi, Chocolate Bayou, or Lake Charles. Preliminary engineering studies under way.

Corpus Christi, Tex. 450,000 t/y vinyl chloride monomer unit under construction. \$200 MM. Engr: Becon. Contr: Bechtel. Completion: 1991.

OXICHEM, Chocolate Bayou, Tex. butadiene plant in the engineering stage. Engr: John Brown. Completion: 1991.

*1,875 b/d MTBE plant planned. Completion: 4th Qtr. 1992.

OXYMAR, Corpus Christi, Tex. 1,500,000 t/y ethylene dichloride plant in the engineering stage. Engr: Toyo Corp. Completion: 1992.

PAXON, Baton Rouge, La. hd polyethylene expansion in the engineering stage. Design: John Brown. Completion: 1991.

PETRO OIL & GAS Inc. Sheridan, Wyo. (joint venture with Perkins Power Inc.) 50 t/d polyurethane plant. \$50 MM.

PHILLIPS 66, Pasadena, Tex. 600 MM lbs/y polyethylene rebuild. Engr: Kellogg. Contr: Brown & Root. Completion: June 1992.

QUANTUM—USI DIVISION, Morris, Ill. 66,000 t/y polypropylene expansion under construction.

ene expansion under construction. Feed: Propylene. Completion: 1991.

SHELL CHEMICAL, Gulf Coast. 450 million lb/y each of ethylene oxide and ethylene glycol. Completion: 1993.

SOUTH HAMPTON Co. Silsbee, Tex. 1,000 b/d solvent fractionation expansion in the engineering stage. Engr: Frantz.

TENNECO Inc. LaPorte, Tex. 12,500 b/d MTBE plant in the engineering stage. Lic/Engr/Contr: Kellogg. Completion: Early 1992.

TENNESSEE EASTMAN, Kingsport, Tenn. Chemicals from coal expansion in the engineering stage. Engr: Bechtel. Completion: 1991.

100,000 t/y Acetic acid expansion under construction. Engr: Bechtel. Completion: 1991.

TEXACO CHEMICAL Co. Port Neches, Tex. 200,000 t/y propylene oxide/MTBE plant in the engineering stage. Engr: Kellogg. Completion: 1994.

TEXAS EASTMAN Co. Longview, Tex. 110,000 t/y polypropylene plant planned. Feed: Propylene. Completion: 1991.

125,000 t/y polyethylene plant planned. Feed: Ethylene. Completion: 1992.

25,000 t/y amorphous polyolefins plant planned. Feed: Propylene. Completion: 1991.

UNION CARBIDE CHEMICALS & PLASTICS Co. Inc. TAFT, La. 410 MM lb/y expansion of ethylene oxide plant. \$200 MM.

UNOCAL, West Sacramento, Calif. Expansion of nitrogen fertilizers complex in the engineering stage. Engr: Fluor Daniels. Completion: 1993.

WESTLAKE STYRENE Corp. Gulf Coast. 160,000 t/y ethylbenzene/styrene plant under construction. Contr: Badger. Completion: 1992.

ALGERIA

\$170 billion petrochemical complex (joint venture with India). 450,000 mt/y ethylene. Proposed.

ENTERPRISE NATIONALE DE LA PETROCHIMIE, Skikda. 50,000 mt/y linear alkylbenzene intermediates. UOP process. \$80 MM.

POLYMED, Skikda. 130,000 mt/y hd polyethylene plant in the engineering stage. Contr: Tecnica/Intec/Dyc. Completion: Late 1993.

SONATRACH, Arzew. 600,000 t/y MTBE plant planned. (joint venture with Total and Ecofuel.).

ARGENTINA

ELECTRODOR, Bahia Blanca, Buenos Aires. 41,500 mt/y polyvinyl chloride plant under construction. Engr: Davy McKee. Completion: 1992.

PASA PETROQUIMICA ARGENTINA, Campana. 40,000 mt/y urea expansion planned. Feed: Natural gas. Completion: 1992.

Neuquen. 150,000 mt/y urea plant planned. Feed: Natural gas. Completion: 1992.

Puerto Gral. San Martin, Santa Fe. 60,000 mt/y benzene expansion planned. Feed: Xylene, toluene and naphtha. Completion: 1991.

120,000 mt/y styrene expansion planned. Feed: Naphtha. Completion: 1991.

120,000 mt/y propylene expansion planned. Feed: Propane. Completion: 1994.

100,000 ACN plant planned. Feed: Propylene. Completion: 1994.

Rosario. ethylbenzene expansion in the engineering stage. Completion: 1993.

styrene monomer expansion in the engineering stage. Completion: 1993.

San Lorenzo, Sante Fe province. ethylene expansion in the engineering stage. Completion: 1993.

PETROQUIMICA BAHIA BLANCA SAIC, Bahia Blanca, Buenos Aires Province. 200,000 mt/y ethylene plant in the engineering stage. \$241 Million. Turnkey contract: Lummus Crest/CTIP/Techint. Project calls for olefins unit, pyrolysis gas unit, C⁴ hydrogenation unit and other facilities. End 1992.

PETROQUIMICA GENERAL MOSCONI, Ensenada. polyethylene terephthalate plant (12,000 mt/y fibre-grade; 5,000 mt/y bottle-grade) in the engineering stage. Contr: Krupp Koppers. Completion: 1993.

45,000 mt/y dimethyl terephthalate plant in the engineering stage. Contr: Krupp Koppers. Completion: 1992.

PEREZ/HIMONT, Neuquen. 100,000 mt/y polypropylene plant. Completion: 1992.

POLITENO, Camacari. 130,000 mt/y polyethylene expansion. Feed: Ethylene. Lic: DuPont. Completion: 1991.

AUSTRIA

AGRO LINZ, Linz. Ammonia plant in the engineering stage. Contr: VAI. Completion: 1992.

AUSTRALIA

ALTONA PETROCHEMICAL Co. Altona. ethylene expansion

in the engineering stage. 310,000 mt/y total capacity. Lic: Stone & Webster. Completion: 1995.

Butadiene plant in the engineering stage. Design/Engr: Davy McKee. Completion: 1993.

BHP PETROLEUM, Laverton. 55,000 mt/y methanol plant in the engineering stage. \$32 MM. Design: Davy McKee. Completion: 1993.

BANGLADESH

JAMUNA FERTILIZER Co. Ltd. Jamalpur. 1,078 mt/d ammonia and 1,700 mt/d urea plant under construction. Contr: Mitsubishi. Completion: Dec. 1991.

MITSUBISHI HEAVY INDUSTRIES Ltd. Tarakandi. 1,700 mt/d urea plant under construction. Design: Snamprogetti. Completion: 1991.

BAHRAIN

BAHRAIN GOVERNMENT. 100,000 mt/y propylene and polypropylene complex. \$200 MM. Feasibility study: Bechtel. Completion: 1991.

BELGIUM

AMOCO CHEMICAL Co. Belgium. 945 mt/d nitric acid plant under construction. Completion: 1991.

ARCO CHEMICAL Co. Rhienne. polypropylene engineering foam resins plant. Completion: 4th Qtr. 1991.

B.A.S.F. Corp. Antwerp. 600,000 mt/y ethylene plant. Completion: Mid 1993.

1,800 mt/d ammonia revamp under construction. Contr: Uhde GmbH. Completion: 1991.

BAYER ANTWERPEN NV, Antwerp. 23,000 mt/y polycarbonate plant under construction. Feed: Bisphenol A. Contr: Fluor Daniel.

24,000 mt/y polycarbonate plant. Feed: Bisphenol A. Contr: Fluor Corp. Planned.

DEN NORSKE STATS OLJESEKSKAP AS and HIMONT NORTH SEA PETROCHEMICAL Inc. Antwerp. 400,000 mt/y splitter for the propylene plant. Feed: Gas liquids. \$404 MM. Tech: Air Products & Chemicals. Contr: Kellogg. Completion: 1991.

ETHYL SA, Feluy. 36,000 mt/y polyalphaolefin plant.

EXXON CHEMICAL, Meerhout. 450,000 mt/y ethylene unit in engineering stage. Feed: Naphtha. Lic: MW Kellogg. Contr: MW Kellogg/FW Italiana. Completion: 1991.

Hd polyethylene conversion under construction. Completion: 1991.

PETROCHEMICAL

FINANESTE NV. Antwerp. 612 mt/y aromatics extraction in the engineering stage. Design: HRI. Completion: 1992.

HIMONT/STATOIL NORTH SEA PETROCHEMICAL. Antwerp. 250,000 mt/y propane dehydrogenation unit under construction. Engr: Kellogg. Completion: 1991.

MONSANTO. Antwerp. Polyvinyl butyral resin expansion under construction. Contr: Badger.

PETROCHIM NV. Feluy. 126,000 mt/y hd polyethylene unit. Contr: Technip. Completion: 1991.

PHENOLCHEMIE GmbH. Antwerpen. 200,000 mt/y phenol and 130,000 mt/y acetone under construction. Contr: Lurgi. Completion: Dec. 1992.

SOLVAY GROUP. Antwerp. 100,000 mt/y hd polyethylene plant. Contr: John Brown. Completion: Late 1991.

80,000 mt/y polypropylene plant. Contr: John Brown. Completion: Late 1991.

BRAZIL

CAPUAVA CARBONOS INDUSTRIAIS SA. Maua, SP. 15,000 mt/y carbon black expansion planned. Feed: Ethylene tar. \$19.2 MM. Completion: 1994.

12,000 mt/y carbon black expansion planned. Feed: Ethylene tar. \$6.5 MM. Completion: 1997.

COPENE. Camaçari. 450,000 mt/y ethylene, 290,000 mt/y propylene, 86,000 mt/y butadiene, 420,000 mt/y pyrolysis gasoline, 200,000 mt/y aromatics (BTX) units under construction. Feed: Gas oil, naphtha. \$548 MM. Completion: 1991.

86,000 mt/y butadiene plant under construction. Feed: Crude. C⁴. Completion: 1991.

25,000 mt/y butene 1 plant under construction. Feed: Raffinate 2. \$15 MM. Completion: 1991.

*60,000 mt/y MTBE plant under construction. \$10 MM. Completion: 1991.

COPERBO. Cabo. 35,000 mt/y polyisoprene plant in engineering stage. Feed: Isoprene.

8,000 thermoplastic elastomer plant planned. Feed: Butadiene, styrene.

ESTIRENO DO NORDESTE. Camaçari, BA. 175 mt/y ethylbenzene revamp in the engineering stage. Engr: Lummus Crest. Completion: 1992.

FIBRA SA. Americana. 2,000 mt/y nylon 6 plant in the engineering stage. Engr: SNIA. Completion: 1992.

NITROFERTIL. Camaçari. Retrofitting existing ammonia plant (200 mt/d) to produce oxo gas and hydrogen.

Laranjeiras. 500,000 mt/d urea expansion in the design stage.

NITRIFLEX SA. Camaçari. *15,000 mt/y san-acrylonitrile styrene plant. Completion: 1994.

*5,500 mt/y MBS resins plant. Completion: 1993.

NITROCARBONO SA. Camaçari. 15,000 mt/y caprolactam and 30,000 mt/y ammonium sulfate expansion planned. Feed: Cyclohexanone, ammonia and hydrogen.

15,900 mt/y cyclohexanone and 4,200 mt/y sodium sulfate expansion planned. Feed: Cyclohexane.

HOQUÍMICA. Triunfo. 25,000 mt/y acrylic acid, 30,000 mt/y esters planned. Feed: Propylene. \$55 MM. Contr: Mitsubishi. Completion: 1991.

PETROFLEX. Rio de Janeiro. styrene revamp in the engineering stage. Completion: 1992.

PETROQUÍMICA UNIÃO. Santo André. 100,000 mt/y ethylene, 56,000 mt/y propylene, 28,000 mt/y butadiene, 104,000 mt/y aromatics units (all total capacities) under way. Feed: Naphtha. Completion: 1993.

*10,000 mt/y resins plant planned. Completion: 1995.

POLIBRASIL. Duque de Caxias. *150,000 mt/y polypropylene plant. \$100 MM. Completion: March 1992.

Itaguaí. 100,000 mt/y polypropylene plant. \$85 MM. Completion: 1996.

POLIOLEFINAS SA. Camaçari, Bahia. 130,000 mt/y linear polyethylene plant. Union Carbide process. Completion: 1991.

Sao Paulo. 100,000 mt/y polypropylene plant. Completion: 1992.

POLITENO. Camaçari. 130,000 mt/y low linear density polyethylene plant under construction. Contr: Lummus/Setal. Completion: 1992.

PRONOR PETROQUÍMICA SA. Camaçari. 30,000 mt/y toluene diisocyanate expansion under way. Feed: Toluene, chlorine, natural gas, nitric acid. Completion: 1991.

52,000 mt/y dimethyl terephthalate expansion planned. Feed: Paraxylene, methanol. Completion: 1991.

8,000 mt/y diphenyl methane diisocyanate expansion planned. Feed: Benzene, chlorine and formaldehyde. Completion: 1992.

PROSINT PRODUTOS SINTÉTICOS SA. Rio de Janeiro. 79,200 mt/y methanol expansion planned. Feed: Natural gas. \$35 MM (U.S.) Completion: Early 1993.

SOLVAY. Sto. Andre, SP. Vi-

nyl chloride monomer, polyvinyl chloride revamp in the engineering stage. Completion: 1992.

BULGARIA

CHIMINVEST. Bourgas. 50,000 mt/y lld polyethylene plant. \$50 MM. Sclairtech process. Lic: DuPont Canada. Contr: Lummus Crest. Engr: Combustion Engineering Inc.

Devnja. 150,000 mt/y vinyl chloride monomer, 120,000 mt/y ethylene dichloride units in engineering stage. Contr: TEC. Completion: 1991.

NEFTOCHIM. Burgas. 14,000 mt/y acrylic fibre plant under construction. Engr: SNIA. Completion: 1992.

150,000 mt/y ethylene plant under construction. Lic: Kellogg. Engr: Kellogg/Setpoint. Contr: Kellogg/Kawasaki. Completion: 1991.

CANADA

ALBERTA ENVIRONFUELS Inc. (Joint venture of Neste Oy, Petro-Canada and Chevron). Edmonton. 530,000 mt/y petrochemical plant to produce MTBE. Engr/Contr: Fluor Daniels. \$350 MM. Completion: 1991.

ALBERTA GAS ETHYLENE Co. Ltd. Joffre, Alta. 680,000 mt/y ethylene, 20,000 mt/y propylene, 28,000 mt/y butadiene, 27,000 mt/y aromatics plant planned. \$350 MM. Feed: Ethane. Completion: 1992.

BORDEN CANADA. Edmonton, Alta. 35,000 mt/y formaldehyde expansion under way. Feed: Methanol.

Laval, Que. 35,000 mt/y formaldehyde expansion under way. Feed: Methanol.

Vancouver, B.C. 25,000 mt/y formaldehyde expansion under way. Feed: Methanol.

West Hill, Ont. 12,000 mt/y formaldehyde expansion under way. Feed: Methanol.

CARGILL Ltd. Bell Plaine, Sask. 1,500 mt/d anhydrous ammonia, 2,000 mt/y urea units. \$350 MM. Lic/Engr/Contr: Uhde. Completion: Spring 1992.

DOW CHEMICAL CANADA Inc. Fort Sask. gas liquids fractionation facility and ethylene plant under construction. 3rd Qtr. 1994.

HUSKY OIL. Lloydminster. 32,000 b/d heavy oil upgrader facility with amine, sulfur and sour water under construction. Design: HRI. Engr: Monenco. Completion: March 1992.

NOVACOR CHEMICALS. Alta. 250,000 mt/y polyethylene unit. Engr/Const. mgmt. Fluor Corp. Completion: 1991.

OCELOT AMMONIA Co. Kiti-

mat. Revamp of plant in the engineering stage. Engr/Contr: Kellogg. Completion: 1992.

PETROMONT Inc. Varennes, Quebec. 40,000 mt/y ethylene revamp under construction. Engr: Stone & Webster. Completion: 1991.

200,000 mt/y hd polyethylene expansion under construction. \$75 MM. Engr: Bechtel. Completion: 1991.

PETROQUÍMICA/SOC. GENERALE DE FINANCEMENT. St. Romuald, Que. 75,000 mt/y linear alkybenzene plant.

SHELL CANADA. Corunna, Ont. 40,000 mt/y styrene expansion planned. Feed: Benzene, ethylene. Completion: 1991.

UNION CARBIDE. Prentiss. 600,000 mt/y ethylene glycol plant planned. Feed: Ethylene. Completion: Late 1994.

CHINA

Anda. 50,000 mt/y ethylene oxide and ethylene glycol units. Royal Dutch Shell process. \$53.5 MM. Contr: Technip. Completion: 1991.

Beijing. 60,000 mt/y styrene monomer plant. Badger process. Contr: Partec Lavalin.

Jinxi, Liaoning Province. 1,000 mt/d ammonia plant in engineering stage. Tech: Braun. Contr: Technip. Completion: 1991.

Erlan, Inner Mongolia. 150 mt/d ammonia expansion under way. \$10 MM. Contr: Humphreys & Glasgow.

Panjin, Liaoning Province. 125,000 mt/y lld polyethylene, 40,000 mt/y polypropylene, 10,000 mt/y butene 1 units. Lic: BP on polyethylene, Mitsui PC on polypropylene, IFF on butene. Contr: Technipetrol. Completion: Sept. 1992.

Xinjiang Uygur Autonomous Region. \$600 MM petrochemical complex that includes a 140,000 mt/y ethylene plant.

BEIJING EASTERN CHEMICAL WORKS. Beijing. 15,000 mt/y acrylic acid expansion under construction. Contr: Mitsubishi. Completion: Dec. 1991.

CHIA TAI Co. Ltd. Shantou Special Economic Zone, Guangdong Province. \$800 MM petrochemical complex (250,000 mt/y ethylene, 480,000 t/y synthetic resin, and 180,000 t/y organic chemicals and other products).

CHINA INTERNATIONAL PETROCHEMICAL Co. Shanghai petrochemical complex. 80,000 mt/y polyethylene plant. Tech: Mitsubishi. Contr: Snamprogetti.

PETROCHEMICAL

CHINA NATIONAL CHEMICAL CONSTRUCTION Corp. Hebei, Henan, Shanxi and Beijing Provinces. 4 urea plants, 400 mt/d each, under construction. Contr: Snamprogetti. Completion: 1991.

Liaoyang. 26,000 mt/y carbon disulfide plant in the engineering stage. Engr: SNIA. Completion: 1992.

Taizhou, Jiaogusu. Secondary Butanol-Alcohol and Methyl Ethyl Ketone plant in the engineering stage. Process design: Edeleanu GmbH. Completion: 1991.

CHINA NATIONAL MACHINERY IMPORT AND EXPORT Corp. Baoji. 400 mt/d urea plant under construction. Design: Snamprogetti. Completion: 1992.

CHINA NATIONAL OFFSHORE OIL Corp./ROYAL DUTCH SHELL. Huizhou, Guangdong. 450,000 mt/y polyethylene plant under study. Completion: 1995.

CHINA NATIONAL TECHNICAL IMPORT Corp. Beijing. 115,000 mt/y ethylene plant and butadiene unit. Completion: Fall 1994.

Dong Fang. 120,000 mt/y ethylene, 35,000 mt/y butadiene extraction in the engineering stage. Contr: TPL. Completion: End 1994.

Dushanzi. 40,000 mt/y ethylene oxide and ethylene glycol plant in the engineering stage. Contr: Tecnicas. Completion: Late 1993.

70,000 mt/y polypropylene plant. Engr: Tecnimont/Intecsa/Udhe. Completion: 1994.

120,000 mt/y polyethylene plant in the engineering stage. Completion: Sept. 1994.

Fuling, Sichuan Province. 1,750 mt/y urea plant under construction. Design: Snamprogetti. Completion: 1993.

Fushun. 72,000 mt/y linear alkylbenzene plant under construction. Contr: Tecnicas. Completion: Late 1991.

50,000 mt/y fatty alcohols plant under construction. Contr: Tecnicas. Completion: Late 1991.

50,000 mt/y ethylene oxide and 50,000 mt/y ethylene glycol unit. Contr: Technip. Completion: 1992.

6,000 mt/y modacrylic fibre plant in the engineering stage. Engr: SNIA. Completion: 1992.

Hejiang, Sichuan Province. 1,000 mt/d ammonia plant in engineering stage. Tech: Braun. Contr: Tecnimont. Completion: 1991.

1,765 mt/d urea plant under construction. Contr: Snamprogetti. Completion: 1991.

Jinan. 75,000 mt/y pure tere-

phthalic acid plant in engineering stage. Contr: MES. Completion: 1991.

Jinxi. 1,760 mt/d urea plant under construction. Design: Snamprogetti. Completion: 1993.

Luoyang. 50,000 mt/y polypropylene plant under construction. Completion: Sept. 1992.

Puyang. 40,000 mt/y polypropylene plant under construction. Contr: Tecnimont. Completion: 1992.

12,000 mt/y butene plant in the engineering stage. Engr: CTIP. Contr: IFP. Completion: 1993.

140,000 mt/y ethylene plant in the engineering stage. Engr: CTIP/Lummus Crest.

140,000 mt/y polyethylene plant in the engineering stage. Engr: CTIP.

Sichuan. 15,000 mt/y alcohols plant in engineering stage. Design/Engr: Udhe. Lic: Henkel. Completion: 1991.

Tianjin. 140,000 mt/y ethylene plant in the engineering stage. Contr: Tecnicas. Completion: Late 1994.

10,000 mt/y methionine plant under construction. Contr: Speichim. Completion: 1992.

Weifang, Shandong. 6,000 mt/y polyethylene plant under construction. Engr: Udhe GmbH.

Zhong Yuan. 12,000 mt/y butene plant in the engineering stage. Engr: CTIP.

CHINA PETROCHEMICAL INTERNATIONAL Co. Jinshanwei. 80,000 mt/y Id polyethylene plant under construction. Design/Contr: Snamprogetti. Completion: 1991.

Dushanzi, Xinjiang. 75,000 mt/y purified terephthalic acid, 14,000 mt/y ethylene, 27,000 mt/y butadiene and 10,000 mt/y butene-1 plant. Contr: Snamprogetti. Completion: Jan. 1995.

JILIN CHEMICAL Inc. Jilin. 27,200 mt/y acrylic acid unit in engineering stage. Contr: JGC. Completion: 1992.

30,000 mt/y acrylic ester unit in engineering stage. Contr: JGC. Completion: 1992.

40,000 mt/y ethylene oxide plant in the engineering stage. Lic: Scientific Design.

NANJING ORIENTAL CHEMICALS Inc. Corp. Nanjing. 50,000 mt/y caprolactam plant under construction. Contr: Deutsche Engr/Voest Alpine. Completion: 1992.

PANZHOU IRON & STEEL WORKS. Dukou. 7,000 mt/y ammonia plant under construction. Contr: Krupp Koppers. Completion: 1991.

QINGDAO COTTON MILL NO. 2. Qingdao Shandong Province. 7,000 mt/y polyamide 6 polymerisation plant in the en-

neering stage. Contr: Zimmer. Completion: 1992.

SHANGHAI PETROCHEMICAL COMPLEX. Shanghai. 70,000 mt/y polypropylene unit under construction. Engr/Design/Contr: Tecnimont. Completion: 1991.

SHANTOU OCEAN AUDIO & VIDEO GENERAL Corp. Shantou, Guangdong Province. 50,000 mt/y polystyrene plant under construction. \$21 MM. Contr: Fluor Daniel. Completion: Late 1991.

URUMQI GENERAL PETROCHEMICAL WORKS. Xinjiang, Uygur. 75,000 mt/y purified terephthalic acid unit and 55,000 mt/y paraxylene unit. Completion: 1995.

YIZHENG Corp. Yizheng. (Joint venture with Amoco Chemical). Polypropylene and purified terephthalic acid plants planned.

ZHENJIANG CHEMICAL FACTORY. Zhejiang Province. (joint venture with Dow Chemical). 20,000 mt/y propylene oxide, 20,000 mt/y polyether polyol, 5,000 mt/y propylene glycol. \$50 MM. Contr: Dow Chemical. Completion: 1993.

ZHONG YUAN PETROCHEMICAL UNITED Corp. Puyang, Henan Province. 140,000 mt/y Id polyethylene plant in engineering stage. Engr: Lummus/CTCI. Contr: CTIP/CNTIC. \$180 MM. Completion: 1992.

140,000 mt/y ethylene plant in engineering stage. Tech: Lummus Crest. Contr: CTIP/CNTIC. Completion: 1992.

12,000 mt/y butenes plant in the engineering stage. Engr: CTIP. Contr: IFP. Completion: 1993.

1,000 mt/d ammonia plant. Contr: Udhe GmbH. Completion: 1991.

CHINA, HONG KONG

CABOT PLASTICS. Hong Kong. 10,000 mt/y expansion of polymer compounding plant in the engineering stage. Contr: Simon-carves. Completion: 1991.

HONG KONG PETROCHEMICALS Co. Yuen Long. 75,000 mt/y polystyrene plant under construction. Engr: Tecnimont. Completion: Feb. 1992.

CHINA, TAIWAN

CHINESE PETROLEUM Corp. Kaohsiung. 400,000 mt/y ethylene, 230,000 mt/y propylene, 67,500 mt/y butadiene, 14,000 b/d aromatics units under construction. Feed: Naphtha and gas oil. Contr: Kellogg. Completion: 1993.

Olefins conversion in the engineering stage. Engr: Foster Wheeler. Completion: 1991.

Lin Yuan. 200,000 mt/y No. 2 xylene separation, 12,000 b/d BTX and 75,000 b/d Naphthapretreat plant under construction. Contr: JGC/CTCI. Completion: 1992.

560 mt/y aromatics extraction under construction. Design: HRI. Completion: 1992.

CHINA PETRO-CHEMICAL INTERNATIONAL Co. 15,000 mt/y polystyrene (SAN) plant. Contr: Toyo Engineering Corp.

CIBA GEIGY TAIWAN Ltd. Kaohsiung. 6,000 mt/y phenolic anti-oxidant plant. Engr/Design: CTCI. Completion: 1991.

FORMOSA PLASTICS Corp. Mailiao. *450,000 mt/y ethylene unit. Engr: Stone & Webster. Completion: 1994.

Taipei. 24,000 mt/y epichlorohydrin plant in the engineering stage. Contr: Comprimo. Completion: 1991.

GRAND PACIFIC PETRO-CHEMICAL Corp. Kaohsiung. 120,000 mt/y styrene monomer plant planned. Feed: Ethylene, benzene. Completion: 1991.

HUALON. Ta Yuan. 29,750 mt/y polyamide 6 polymerisation in the engineering stage. Completion: 1991.

HO TUNG CHEMICAL Corp. Jen-Wu, Kaohsiung. 40,000 mt/y n-paraffins plant under construction. Feed: Kerosine. Completion: 1991.

ICI. 350,000 mt/y purified terephthalic acid plant under construction. Engr/Contr: John Brown. Completion: 1992.

IMPERIAL CHEMICAL INDUSTRIES plc. Taiwan. 350,000 mt/y terephthalic acid plant. \$250 MM. Contr: John Brown. Completion: Early 1990's.

NAN YA PLASTICS Corp. Naju. 150,000 mt/y 2-ethyl hexanol, 20,000 mt/y butanols in the engineering stage. Engr: Davy McKee. \$100MM.

ORIENTAL UNION CHEMICAL Corp. Kaohsiung. Ethylene glycol plant planned. Feed: Ethylene.

TAIWAN PROSOPERY CHEMICAL Co. Kaohsiung. *135,000 mt/y cumene, 100,000 mt/y phenol and 81,600 mt/y acetone complex in the engineering stage. Engr: Kellogg. Completion: 1993.

TUNTEX PETROCHEMICAL Inc. Shan-Shang. *285,000 mt/y terephthalic acid plant under construction. Lic: Tecnimont. Engr: Hiyachi.

UNION PETROCHEMICAL Corp. Lin Yuan. 32,300 mt/y phthalic anhydride plant and

PETROCHEMICAL

3,000 fumaric acid plant under construction. Contr: Davy McKee. Completion: 1991.

YUNG CHIA CHEMICAL INDUSTRIAL Corp. Lin-Yuan. 110,000 mt/y polypropylene expansion under construction. Lic: BASF.

COLOMBIA

CARBOQUIMICA SA. Bogota. *5,000 mt/y phthalic anhydride expansion under construction.

DOW QUIMICA DE COLOMBIA. Cartagena. 40,000 mt/y polystyrene plant. Feed: Styrene. \$16MM. Completion: Late 1991.

ECOPETROL. Barrancabermeja. *34,000 mt/y polyethylene expansion under construction. Completion: 1994.

PETROQUIMICA COLOMBIANA SA. Cartagena. 40,000 mt/y polyvinyl chloride expansion under construction. Completion: Jan. 1992.

CZECHOSLOVAKIA

CHEMICKÉ ZAVODY SOKOLOV. Sokolov. 25,000 mt/y acrylic acid and 24,000 mt/y acrylic ester in the engineering stage. Lic: Mitsubishi/JGC Corp. Completion: 1995.

CHEMOPETROL. Humenne. 17,500 mt/y polyamide 6 polymerization in the engineering stage. Contr: Zimmer. Completion: 1992.

Lovosice. 1,200 mt/d CAN plant under construction. Completion: 1991.

Neratovice. 120,000 mt/y normal alpha olefins plant under construction. Completion: 1992.

SLOVENSKÝ HODVAB. Se-mica. 4,900 mt/y polyester solid state polycondensation in the engineering stage. Contr: Zimmer. Completion: 1992.

SPOLANA. Spolana, Neratovice. *120,000 mt/y linear alphaolefins plant under construction. Completion: April 1992.

TECHNOEXPORT-PRAHA. Lovosice. 1,200 mt/d calcium, ammonia, nitrate plant in the engineering phase. \$43 MM. Completion: 1991.

Neratovice. 120,000 mt/y alphaolefins plant under construction. Contr: VAI. Completion: 1992.

EGYPT

EGYPTIAN PETRO. Co. El-Amerya-Alex. 80,000 mt/y ld & hd polyethylene plant under study.

FRANCE

ATOCHÉM. Fos Sur Mer. vinyl chloride production expansion. Engr: Heurtey.

Lavera. 4,000 mt/y polybutadiene plant postponed.

BP CHEMICAL. Lavera. revamp and extend Polybutene capacity.

CRD TOTAL. Flandres, Dunkirk. addition of a propane/propylene unit under construction. Contr: Heurtey Industries.

EXXON CHEMICAL Ltd. Le Havre. 140,000 mt/y polypropylene plant proposed.

NAPHTHACHIMIE SA. Lavera. 150,000 mt/y ethylene plant upgrade, debottlenecking cracker 4. Turnkey/Contr: Lummus Crest. 1992.

NORSOLOR. Chaling. Polystyrene plant in engineering stage. Contr: Foster Wheeler. Completion: 1991.

OXOCHEMIE SA. Lavera. 170,000 mt/y n-butylaldehyde in the engineering stage. Contr: Davy McKee. Completion: 1991.

RHONE-POULENC CHIMIE. Roussillon. *50,000 mt/y phenol expansion under construction. Completion: Early 1992.

***Pardies.** 70,000 mt/y acetic acid expansion planned.

SHELL CHIMIE. Berre L'Etang. Thermo-plastic rubber plant. Contr: Technip. 1991.

130,000 mt/y polypropylene plant. Completion: 1991.

SOCIÉTÉ FRANÇAISE EXXON CHEMICAL Ltd. Notre Dame de Gravenchon. 220,000 mt/y ld polyethylene plant under construction. \$158 MM. Contr: Foster Wheeler. Completion: 1992.

140,000 mt/y polypropylene plant under construction. Contr: Foster Wheeler. Completion: Late 1991.

GERMANY

BASF. Wesseling. 60,000 mt/y polypropylene plant. Completion: 1991.

DEUTSCHE SHELL. Godorf. aromatics revamp in the engineering stage. Completion: 1992.

HOECHST. Knapenack. 120,000 mt/y polypropylene plant. Completion: 1991.

HUELS AG. Lulsdorf. 60,000-70,000 mt/y dimethyl terephthalate revamp. Completion: 1992.

100,000 mt/y pure terephthalate acid plant. Completion: 1992.

Marls. Acetylene plant in the engineering stage. Contr: Linde. Completion: 1991.

260,000 mt/y oxychlorination plant in the engineering stage. Design: Lurgi GbmH. Completion: 1992.

140,000 mt/y vinyl chloride plant in the engineering stage. Design: Lurgi GbmH. Completion: 1992.

120,000 mt/y polyethylene

plant. Process: Union Carbide. Completion: 1993.

LEUNA-WERKE. Leuna. Reconstruction of phenol unit under construction. Completion: 1991.

RHEINISCHE OLEFIN-WERKE. Wesseling. 120,000 mt/y expansion of ethylene plant in the engineering stage. (two cracking furnaces) Contr: KTI. Completion: 1991.

90,000 mt/y expansion olefin plant in the engineering stage. Tech: Linde. Contr: KTI. Completion: 1991.

ROHM GmbH. Worms. 20,000 mt/y dispersed polymers expansion in the design stage. Lic: Rohm.

RUHR OEL. Gelsenkirchen. 70,000 mt/y cumene expansion. Feed: Benzene, propylene.

100,000 mt/y benzene plant in the under construction. Feed: pyrolysis gasoline. Lic/Contr: Lurgi GbmH. Completion: 1992.

100,000 mt/y benzene plant in the engineering stage. Lic: Veba Oel Tech. Contr: Lurgi GbmH. Completion: 1992.

Munchmunster. 80,000 mt/y ethylene and 60,000 propylene expansion under construction. Contr: Lummus. Completion: 1991.

Scholven. 143,000 mt/y aromatics in the engineering stage. Design: Lurgi GbmH. Completion: 1992.

SHELL. Wesseling. 120,000 mt/y polypropylene plant. Completion: 1991.

UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF. Wesseling. Planned expansion of the following: 40,000 mt/y ethylene, 23,000 mt/y propylene, 12,000 mt/y C4-cut, 26,000 mt/y pyrolysis gasoline, 4,000 mt/y fuel oils. Feed: Naphtha. Contr: Lummus Crest/Santa Fe Braun. Completion: 1991.

VEBA OEL AG. Gelsenkirchen. 440,000 mt/y olefin plant in the engineering stage. Contr: Linde. Completion: 1992.

HUNGARY

CHEMOLOMPLEX. Leninvaros. 8,000 mt/y isobutene under construction. Design: Snamprogetti. Completion: 1992.

DUNAMONT Co. Ltd. Szazhalombatta. 65,000 mt/y polystyrene plant under construction. Feed: Styrene. Contr: Technimont/Danube Refinery. Completion: 1991.

20,000 mt/y polystyrene plant under construction. Feed: Styrene. Contr: Technimont/Danube Refinery. Completion: 1991.

TISZAI VEGYI KOMBINAT. Tiszaujvaros. *60,000 mt/y ld polyethylene plant under construction. Completion: 1991.

*Ethylene revamp under construction. Contr: Linde. Completion: 1991.

INDIA

ANDHRA PETROCHEMICAL Ltd. Visakhapatnam, Andhra Pradesh. 30,000 mt/y 2-ethyl hexanol butanols (LP oxo process) under construction. Contr: Davy McKee. Completion: 1991.

Udhna, Surat. *7,200 mt/y maleic anhydride plant. Lic: Scientific Design. Completion: Oct. 1992.

BINDAL AGRO CHEMICAL Ltd. Shahjahnpur. 2 urea plants 1,100 mt/d each and 1,350 mt/d ammonia plant under construction. Design: Snamprogetti. Completion: 1994.

BOMBAY DYEING & MFG. Co. Ltd. Patalganga, Maharashtra. 40,000 mt/y dimethyl terephthalate under construction. Completion: Early 1993.

CHAMBAL FERTILIZERS & CHEMICALS Ltd. Gadepan, Kota district. 1,350 mt/d ammonia plant under construction. Contr: Snamprogetti. Completion: 1991.

1,125 mt/d each, 2 urea plants under construction. Contr: Snamprogetti. Completion: 1991.

CONSOLIDATED FIBRES & CHEMICAL Ltd. Haldia. 12,000 mt/y Acrylic fibre plant under construction. \$57 million. Contr: Davy Powergas. Completion: 1991.

DEEPAK FERTILIZERS & CHEMICALS Corp. Ltd. Talaja, Maharashtra. 16,500 mt/y carbon dioxide, 45,000 mt/y formaldehyde and 10,000 mt/y hexamine plant in the engineering stage. \$10 MM. Contr: Davy Powergas. Completion: 1992.

FERTILIZERS AND CHEMICALS TRAVACORE Ltd. Ambalamedu. 397,000 mt/y ammonia expansion (replacement of old plants with expansion in capacity.) Feed: Naphtha. Contr: Fact Engineering. Completion: 1992.

Udyogamandal. 297,000 mt/y ammonia plant pending gov't approval. Replacement of old plant with capacity expansion.

FINOLEX. Ratnagiri. 80,000 mt/y polyvinyl chloride plant in the engineering stage. Design: Uhde GmbH.

20,000 mt/y polyvinyl chloride plant in the engineering stage. Design: Uhde GmbH.

100,000 mt/y vinyl chloride monomer plant in the engineering stage. Design: Uhde GmbH.

GAS AUTHORITY OF INDIA Ltd. Auraiya, Uttar Pradesh. undisclosed volume of olefins and polyolefins. \$1.65 billion. Planned.

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Vijaipur. 100,000 mt/y polypropylene plant in the engineering stage. Engr: Tecnimont. Completion: 1992.

GNFC, India. 620 mt/d nitric acid, 100 mt/d high conc. nitric acid, 475 mt/d nitric phosphate, 475 mt/d calc. amm. nitrate. New plant under construction. Contr: Uhde GmbH. Completion: 1991.

GUJARAT GODREJ INNOVATIVE CHEMICAL Ltd. Bharuch, Gujarat. 30,000 mt/y alpha olefins plant under construction. Contr: Davy Powergas. Completion: 1991.

GUJARAT NARMADA VALLEY FERTILIZERS Co. Ltd. Narmadanagar, Bharuch.

50,000 mt/y acetic acid unit under construction. Feed: Methanol, carbon monoxide. \$40 MM. Contr: BP/MES. Completion: Dec. 1991.

GUJARAT STATE FERTILISERS Co. Ltd. Baroda. 5,000 mt/y melamine expansion in the engineering stage. \$35 MM. Contr: Davy Powergas. Completion: 1993.

*445,000 mt/y ammonia expansion planned. Completion: 1994.

HERDILLIA CHEMICALS Ltd. Thane. *1,500 mt/y propylene oxide plant planned.

HINDUSTAN PETROLEUM Corp. Visakhapatnam. 23,000 mt/y propylene expansion in the engineering stage. Completion: 1991.

45,000 mt/y N-paraffin expansion planned. Completion: 1994.

INDIAN ADDITIVES Ltd. Madras. 15,000 mt/y lube oil additives plant. Completion: End 1991. (joint venture of Chevron Chemical Co. and Madras Refineries Ltd.)

INDIAN OIL Corp. Baroda. steamreformer shift PSA in the engineering stage. Contr: Linde. Completion: 1991.

INDIAN PETROCHEMICAL Corp. Ltd. Baroda. 75,000 mt/y polypropylene plant. Contr: Tecnimont. Completion: 1994.

Gujarat. petrochemical complex. \$1.52 billion.

KESAN PETROPRODUCTS Ltd. Lote Parsurahn. 5,000 mt/y bisphenol A in the engineering stage. Contr: Davy McKee. Completion: 1992.

McDOWELL & Co. Ltd. (Polymers Division). Visakhapatnam. 66,000 mt/y styrene plant planned. Feed: Ethylbenzene. Completion: 1992.

20,000 mt/y polystyrene plant planned. Feed: Styrene. Completion: 1992.

MURABBLACK INDIA Ltd. Tarapur. 9,000 mt/y carbon black plant in the engineering

stage. Contr: Davy McKee. Completion: 1991.

NAGARJUNA FERTILIZERS & CHEMICALS Ltd. Kakinada. 900 t/d ammonia and 1,500 mt/d urea plant under construction. Design/Contr: Snamprogetti. Completion: 1991.

NATIONAL AROMATICS & PETROCHEMICALS Corp. Ltd. Manali, Tamil Nadu. *200,000 mt/y purified terephthalic acid/aromatics complex. Completion: 1994.

POLYCHEM Ltd. Maharashtra. *80,000 mt/y styrene. 40,000 mt/y polystyrene and 3,000 mt/y toluene plant. Completion: Early 1994.

RASHTRIYA ISPAT NIGAM. Visakhapatnam. 33,000 mt/y aromatics plant in the engineering stage. Contr: Krupp Koppers. Completion: 1992.

RELIANCE INDUSTRIES Ltd. Hazira, Gujarat. six petrochemical plants costing a total of \$685 million.

SYNTHETICS & CHEMICALS Ltd. Bareilly. 48,750 mt/y styrene expansion planned. Feed: Alcohol, benzene.

TATA CHEMICALS Ltd. Baramba, Uttar Pradesh. 1,350 mt/d ammonia plant under construction. Contr: Snamprogetti. Completion: 1992.

2 urea units. 1,125 mt/d each under construction. Contr: Snamprogetti. Completion: 1992.

THIRUMALAI CHEMICALS Ltd. Ranipet (Tamil Nadu). 10,000 mt/y maleic anhydride plant in the engineering stage. Feed: Benzene, butane. \$22 MM. Contr: Alusuisse Italia/Davy Powergas. Completion: 1991.

VINATI ORGANIOS. Mahad. *1,000 mt/y isobutylbenzene plant in the engineering stage. Contr: IFF. Completion: 1991.

INDONESIA

Bunyu, East Kalimantan. 300,000 mt/y MTBE plant. Completion: 1993.

60,000 mt/y acetic acid plant. Completion: 1993.

Dumai, Sumatra. 75,000 mt/y normal paraffins plant. Completion: 1992.

Musi, South Sumatra. 10,000 mt/y MEK plant. Completion: 1992.

BP CHEMICALS. West Java. (joint venture with Indonesian government) 400,000 mt/y polyethylene plant. \$200 MM. Completion: 1991.

INDO RAMA SYNTHETICS. 50,000 mt/y polyester plant under construction. \$60 million. Contr: Davy Powergas India. Completion: 1991.

OLEFIN CENTER SHELL GROUP. Cilacap, Central Java.

50,000 mt/y ethylene, 50,000 mt/y propylene, 225,000 mt/y polyethylene, 125,000 mt/y polypropylene, 100,000 mt/y ethylene glycol, 120,000 mt/y LPG, 45,000 mt/y fuel gas, 240,000 mt/y fuel oil, 170,000 mt/y C₃-Py gas, and 120,000 mt/y C₃-Py gas units. Completion: 1993.

PERTAMINA. Arun, Aceh, North Sumatra. 321,000 mt/y benzene, 19,600 mt/y toluene, 217,000 mt/y xylene mix, 39,700 mt/y orthoxylene, 180,000 mt/y CHX units planned. Feed: Condensate. Contr: Kellogg/Thyssen/Humpuss. \$1,275 MM. Completion: 1992-93.

335,000 mt/y paraxylene and 150,000 mt/y benzene. Contr: Mitsui & Co./Chiyoda Corp./Thyssen. Completion: 1993.

Cilacap, Java. 375,000 mt/y ethylene, 225,000 mt/y propylene, 300,000 mt/y polyethylene, 180,000 mt/y polypropylene, 100,000 mt/y MEG units planned. Feed: Naphtha, raffinate, residue. \$1,500 MM. Completion: 1993.

270,000 mt/y paraxylene, 120,000 mt/y benzene, 11,220 mt/y aromatics, 23,000 LPG, 93,720 mt/y raffinate units under construction. Feed: Naphtha. \$416 MM. Contr: JGC Consortium. Completion: 1991.

Pare-Pare, South Sulawesi. 660,000 mt/y methanol plant. Feed: Natural gas. \$282 MM. Completion: 1992.

Plaia, South Sumatra. 30,000 mt/y polypropylene expansion. Feed: Propylene. \$40 MM. Completion: 1992.

PERTAMINA, BRITISH PETROLEUM, CHEVRON (Gulf Corp.). PT ARSETO. Cilegon, West Java. 300,000 mt/y polyethylene plant. Completion: 1991.

PETROKIMIA NUSANTARA INTERINDO. Merak, West Java. (joint venture of B.P. Co., Mitsui Petro. Industries Ltd., and Sumitomo Chemical Co.) 400,000 mt/y polyethylene plant. Completion: Late 1992.

East Java. 1,350 mt/d ammonia plant in the engineering stage. Lic/Engr: Kellogg. Completion: 1993.

PT AMOCO INDOPRAKARSA. Java. 250,000 mt/y purified terephthalic plant. Process design in progress.

PT ARUN AROMATIK INDONESIA. Arun, Sumatra. 321,200 mt/y benzene, 39,700 mt/y orthoxylene, 180,000 mt/y cyclohexane, 19,600 mt/y toluene, 217,200 mt/y mixed xylene, 254,000 mt/y LPG, 225,800 mt/y raffinate, 776,000 mt/y kerosene, 719,000 mt/y EPCC bottoms, and 676,000 mt/y depropanizer bottoms units. Completion: 1992.

PT ASEAN POLYMERS. Cilegon, West Java. 100,000 mt/y polypropylene plant. Completion: 1991.

PT BRANTA MULIA. Nylon 66 plant under construction. Engr: Bechtel. Completion: 1992.

PT CHANDRA ASRI. Serang, Java. 550,000 mt/y ethylene and 300,000 mt/y propylene plant in the engineering stage. Lic: ABB Lummus. Contr: Toyo Engr. Corp. Completion: 1993.

PT GRAHA SWAKARSA PRIMA. West Java. 120,000 mt/y ethylbenzene to styrene monomer unit.

PT INDRAMATA SYNTHETICS. Purwakarta. 52,500 mt/y polyester polycondensation under construction. Contr: Zimmer. Completion: 1991.

PT PTA INDONESIA. Arun, Aceh. 250,000 mt/y purified terephthalic acid. Completion: 1993.

PT PUPUK SRINIDAJA. Palembang, South Sumatra. 1,350 mt/d ammonia plant and 1,725 mt/d urea plant under construction. Lic: Toyo Engineering Corp. Completion: Late 1992.

PT TRI POLYTA INDONESIA. Cilegon, West Java. 160,000 mt/y polypropylene plant. Contr: Toyo Engineering Corp. Completion: 1993.

PT STYRINDO MONO INDONESIA. Merak. 100,000 mt/y styrene monomer plant in the engineering stage. Process: ABB Lummus. Contr: Toyo Engr. Corp.

PT UNGGUL INDAH CORP. Merak. 60,000 mt/y alkyl benzene under construction. Design/Engr/Contr: Chisso Engr. Completion: 1992.

PT YASON PERSADA. Tangerang. 22,750 mt/y polyamide 6 polymerisation plant in the engineering stage. Contr: Zimmer. Completion: 1992.

PUSRI. Palembang. 1,350 mt/d ammonia plant in the engineering stage. Lic/Engr: Kellogg. Contr: Kellogg/Rekayasa. Completion: 1992.

SUMITOMO. Java. 100,000 mt/y polypropylene plant. Completion: 1991.

STYRENE MONOMER INDONESIA. Merak. 100 kt/y styrene plant in the engineering stage. Engr: Lummus Crest. Completion: 1992.

TPI. Cilacap, Java. 180,000 mt/y polypropylene plant. Completion: 1991.

IRAN

ARAK PETROCHEMICAL Co. Arak. 113,000 mt/y ethylene oxide and 105,000 mt/y ethylene glycol plant in the engineering stage. Turn-key: Tecnimont. 1993.

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55,000 mt/y oxo alcohol plant in the engineering stage. Turnkey: Speichim. Completion: 1994.

*60,000 mt/y 1d polyethylene, 7,000 mt/y butene plant under construction. Contr: TPL. Completion: Dec. 1991.

*240,000 mt/y ethylene plant under construction. Contr: TPL. Completion: March 1992.

BANDAR IMAM PETROLEUM Co. Bandar Imam. 50,000 mt/y hd and 60,000 mt/y 1d polyethylene and 100,000 polypropylene reconstruction. Completion: 1993.

*175,000 mt/y polyvinyl chloride unit in the engineering stage. Design/Engr/Contr: Krupp Kopper. Completion: 1994.

*150,000 mt/y vinyl chloride monomer reconstruction in the engineering stage. Engr/Contr: Krupp Kopper. Completion: 1994.

FIPCO. Esfahan. 60,000 mt/y dimethyl terephthalate under construction. Contr: Krupp Koppers. Completion: 1992.

IRAN CHEMICAL INDUSTRIES INVESTMENT Co. Esfahan. 50,000 mt/y linear alkyl benzene unit under construction. Design/Contr: Snamprogetti. Completion: 1991.

NATIONAL PETROCHEMICAL Co. Arak. 24,000 mt/y acetaldehyde plant in engineering stage. Contr: Uhde. Lic: Aldehyd. Completion: 1992.

30,000 mt/y acetic acid plant in engineering stage. Contr: Uhde. Lic: Hoechst. Completion: 1992.

30,000 mt/y vinyl acetate monomer plant in engineering stage. Contr: Uhde. Lic: Bayer. Completion: 1992.

250,000 mt/y ethylene plant under construction. Contr: TPL/KTI. Completion: 1992.

60,000 mt/y hd polyethylene plant. Contr: Uhde. Completion: 1992.

105,000 mt/y pyrolysis gasoline hydrogen plant in the engineering stage. Completion: Dec. 1991.

*7,000 mt/y butenes plant under construction. Engr: TPL. Contr: IFP. Completion: 1992.

Bandar Khomeini. 1.3 million mt/y LPG unit and three utilities. Reconstruction. Contr: Lummus Crest/Krupp Koppers.

300,000 mt/y ethylene plant. Contr: Daelim Industrial Co.

*175,000 mt/y polyvinyl chloride plant. Contr: Krupp Koppers. Completion: Dec. 1992.

Esfahan. aromatics plant under construction. Contr: Tecnica. Completion: 1991.

Tabriz. 136,000 mt/y ethylene plant under construction. Contr: KTI/TPL. Completion: May 1993

*55,000 mt/y aromatics plant in the engineering stage. Design: Krupp Kopper. Completion: 1994.

*100,000 mt/y polyethylene, 7,000 mt/y butene plant in the engineering stage. Contr: TPL. Completion: Mid-1994.

IRAQ

MINISTRY OF INDUSTRY. Baghdad. 1,000 t/d ammonia and 1,750 t/d urea plant in the engineering stage. Engr/Contr: Kellogg. Completion: 1992.

IRELAND

UNIFI TEXTURED YARNS EUROPE Ltd. Leterkenny. 9,800 mt/y polyester polycondensation in the engineering stage. Contr: Zimmer. Completion: 1992.

ISRAEL

GADOT PETROCHEMICAL INDUSTRIES Ltd. Haifa Bay. 30,000 mt/y paraxylene expansion. Feed: Xylenes.

ITALY

ACETATI. Palianza. 44,000 mt/y acetic anhydride plant under construction. Engr: Tecmont. Completion: 1991.

ALUSUISSE ITALIA SpA. Ravenna. 50,000 mt/y maleic anhydride plant planned. Feed: N-butane. Completion: 1992.

ASHLAND CHEMICAL ITALIANA SpA. Milano. *1,000 mt/y acrylics and 7,000 mt/y alkyds.

BRINDISI ETILENE Srl. 350,000 mt/y ethylene plant under construction. Design: Snamprogetti. Completion: 1992.

DUTRAL. Ferrara. 25,000 mt/y synthetic rubber plant under construction. Engr: Tecmont. Completion: 1991.

ENICHEM. Augusta. 240 mt/d kerosene feed pretreatment expansion under construction. Engr: CTIP.

110 t/d oxo-alcohol expansion under construction. Contr: CTIP. Completion: 1991.

ENICHEM ANIC. Gela. 100,000 cum/h WSA-SNO, under construction. Contr: Snamprogetti. Completion: 1993.

40,000 mt/y etoxilated alcohols plant under construction. Contr: Techint. Completion: Nov. 1991.

Brindisi. Cracking plant with capacities of 400,000 mt/y of ethylene, 200,000 mt/y of propylene, and 90,000 mt/y of butane fractions under construction. Completion: May 1992.

HIMONT ITALIA. Brindisi. 180,000 mt/y polypropylene plant. Completion: 3rd Qtr. 1992.

IGI SUD. Ferrara. 5,000 mt/y argon recovery plant in the engi-

neering stage. Design/Engr: Techint. Completion: 1992.

MONTEDIPE. Mantua. 150,000 mt/y ethylbenzene plant under construction. Engr: Tecmont. Completion: 1991.

SIPET SpA. Frosinone. 63,000 mt/y polyester polycondensation plant in the engineering stage. Contr: Zimmer. Completion: 1992.

SOLVAY & Co. Rosignano. 45,000 mt/y polyethylene finishing units in the engineering stage (natural PE & black PE). Completion: Oct. 1993.

TECONYLON. Ceriano L. 30,000 mt/y nylon 6.6 polymerization plant under construction. Engr: SNIA. Completion: 1991.

JAPAN

DAICEL CHEMICAL INDUSTRIES Ltd. Shizuoka. 20,900 mt/y formalin plant. Contr: Toyo Engineering Corp. Lic: Mitsui Toatsu.

IDEMITSU PETROCHEMICAL Co. Chiba. 50,000 mt/y polypropylene plant in the engineering stage. Design: Uhde GmbH.

JAPAN SYNTHETIC RUBBER Co. Ltd. Kashima, Ibaraki. *20,000 mt/y EPDM plant. Completion: Fall 1992.

LUCKY HOECHST CORP. Yeochon. 120,000 mt/y hd polyethylene plant in the engineering stage. Design: Uhde GmbH.

MISUBISHI KASEI. Mizushima. 60,000 mt/y polypropylene plant. Completion: 1991.

MITSUBISHI KASEI POLYTEC Co. Yokkaichi. *40,000 mt/y polystyrene expansion under construction. Completion: 2nd Qtr. 1992.

MITSUBISHI TOATSU CHEMICALS Inc. Osaka. 1,000 mt/d retrofit of ammonia converter. Engr: Toyo Engineering Corp. Lic: Kellogg.

MITSUBISHI PETROCHEMICAL Co. Kashima. Ethylene Ox² ide and ethylene glycols plant under construction. Contr: Mitsubishi. Completion: April 1992.

80,000 mt/y polypropylene plant under construction. Contr: Mitsubishi. Completion: May 1992.

80,000 mt/y polyethylene plant under construction. Contr: Mitsubishi. Completion: March 1992.

NIHON POLYSTYRENE Co. Ltd. Kawasaki. 30,000 mt/y polystyrene expansion under construction.

NIPPON SHOKUBAI KAGAKU KOGYO Co. Chiyodaku. 60,000 mt/y acrylic acid, 25,000 mt/y ethylene glycol, and 25,000 mt/y ethylene oxide expansion.

SAMKYUNG CHEMICAL Co. Ltd. Ulsan. *10,000 mt/y phthalic anhydride expansion under construction. Contr: Lurgi. Completion: 1992.

*1,500 mt/y fumaric acid under construction. Contr: Mannesman. Completion: 1992.

SHOWA DENKO K.K. Oita. 60,000 mt/y polyethylene plant under construction. Contr: Mitsubishi. Completion: Dec. 1991.

TONEN SEKIYUKAGAKU KK. Kawasaki. 20,000 mt/y butanediol plant in the engineering stage. Design/Engr: Davy McKee. Completion: Late 1991.

35 mt/y maleic anhydride plant in the engineering stage. Completion: 1992.

TOSOH Corp. Yokkaichi. 150,000 mt/y ethylene expansion. Completion: 1993-95.

70,000 mt/y polypropylene plant. Completion: 1992.

KOREA

BP CHEMICALS. Acetic acid plant planned.

DAELIM INDUSTRIAL Co. 100,000 mt/y 1d polyethylene in the engineering stage. Design: Simon-Craves. Completion: 1991.

Yochon. 92,000 mt/y MTBE plant under construction. Design: Snamprogetti. Completion: 1991.

20,000 mt/y isobutene-1 recovery plant under construction. Design: Snamprogetti. Completion: 1991.

DONGBU CHEMICAL. Ulsan. 30,000 mt/y polystyrene in the engineering stage. Lic/Engr: Lummus Crest. Completion: 1992.

DONG SUNG CHEMICALS INDUSTRIES Ltd. Korea. 20,000 mt/y butane plant under construction. Engr: Davy McKee. Completion: 1991.

HAN YANG CHEMICAL Corp. Yeochon. 350,000 mt/y naphtha cracking plant. Contr: Stone & Webster.

250 mt/y aromatics extraction in the engineering stage. Design: HRI. Completion: 1992.

*350,000 mt/y ethylene unit under construction. Lic/Engr: Stone & Webster. Completion: 1992.

HANIL SYNTHETIC FIBRE. Masan. 14,000 mt/y acrylic fibre plant under construction. Engr: SNIA. Completion: 1991.

HONAM PETROCHEMICAL Corp. Yeosu. 350,000 mt/y ethylene plant under construction. Contr: Toyo Engineering Corp.

HYUNDAI PETROCHEMICAL. Daesan. 60,000 mt/y 1d polyethylene plant in the engi-

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neering stage. \$80 MM. Engr: John Brown. Completion: 1991.

142 mt/y aromatics extraction under construction. Design: HRI. Completion: 1991.

350,000 mt/y ethylene plant under construction. Engr: Kellogg/Hyundai. Contr: Hyundai. Completion: 1991.

Ulsan. styrene-butadiene-acrylonitrile/methyl ethyl ketone plant in the engineering stage. Engr: Edeleanu. Completion: 1992.

ISU CHEMICALS. Onsan. 200,000 mt/y polypropylene plant. Completion: 1991.

KOC. Korea. 300 mt/d nitric acid plant. Contr: Uhde GmbH. Completion: 1991.

KOHAP CHEMICAL CORP. Seoul. 65 mt/d nylon 66 chips under construction. Contr: Davy McKee. Completion: 1991.

KOLON INDUSTRIES. Gumi City. 22,750 mt/y polyamide 6 polymerization in the engineering stage. Contr: Zimmer. Completion: 1992.

KOREA PETROCHEMICAL INDUSTRIES Co. Ltd. Onsan. 250,000 mt/y polymer grade ethylene and 145,000 mt/y propylene plant. Tech: Lummus Crest.

KOREA POLYOL Co. Ltd. Seosan. 20,000 mt/y ethanol amine under construction. Design/Engr: Chisso Engr. Completion: 1991.

LUCKY PETROCHEMICAL Ltd. Yeochon. 210 mt/y aromatics extraction in the engineering stage. Design: HRI. Completion: 1992.

SAMSUNG GENERAL CHEMICALS Co. Ltd. Daesan. 260,000 mt/y benzene/toluene plant in the engineering stage. Lic: Krupp Kopper. Completion: 1991.

80,000 mt/y ethylene oxide/glycol plant under construction. Lic: Scientific Design. Completion: 1991.

Seosang. \$20 million aromatics complex. Products: toluene, xylene, and ethylbenzene for conversion to 140,000 mt/y of benzene. Completion: summer 1992.

Seosa. 31,000 mt/y isobutylene unit. Completion: 1991.

TAE KWANG INDUSTRIAL Co. Ulsan. 17,500 mt/y polyamide 6 polymerization in the engineering stage. Contr: Zimmer. Completion: 1992.

TONGYANG NYLON. Ulsan, South Korea. 165,000 mt/y polymer grade propylene. Lic: UOP. 120,000 mt/y caprolactam in the engineering stage. Contr: Zimmer. Completion: 1992.

YUKONG Ltd. Ulsan. 35,000 mt/y isopropanol plant and 50,000 mt/y secondary butanol/

methyl ethyl ketone unit in the engineering stage. \$72 MM. Design/Engr: Edeleanu GmbH. Completion: 1992.

LIBYA

NAPETCO. Marsa el Brega. 1,200 mt/d ammonia revamp under construction. Contr: Uhde GmbH. Completion: 1991.

RAS LANUF OIL & GAS PROCESSING Co. Ras Lanuf. 80,000 mt/y hd polyethylene and 80,000 mt/y lid polyethylene plant in the engineering stage. Turnkey: Hyundai E & C Completion: Feb. 1993.

*88,000 mt/y benzene, 58,600 mt/y butadiene, 47,700 mt/y MTBE, 18,300 mt/y Butene-1 expansion. Completion: 1993.

*68,000 mt/y polypropylene expansion proposed. Completion: 1994.

MALAYSIA

ASEAN BINTULU FERTILIZER SDN. BHD. Bintulu. 66,000 mt/y synthesis gas/ammonia expansion under construction. Design: Uhde. Completion: 1991.

EXXON CHEMICAL Co. Kerteh. 450,000 mt/y ethylene and 450,000 mt/y polyethylene plant awaiting govt approval. Completion: 1994.

MTBE MALAYSIA. Kuantan. (joint venture with-Petronas, Idemitsu Petrochemical and Neste Oy) 80,000 mt/y polypropylene, 80,000 mt/y propylene and 300,000 mt/y MTBE plants under construction. Lic: IFF. Engr: Kellogg. Contr: Mitsubishi/Kellogg. Completion: Aug. 1992.

PAN-CENTURY OLEOCHEMICALS Sdn Bhd. Pasir Gudang Johor. 60,000 mt/y oleochemicals plant in the engineering stage. Engr: Davy Powergas India. Completion: 1992.

PETRONAS. Kuantan. 80,000 mt/y polypropylene plant in the engineering stage. Completion: 1992.

80,000 mt/y propylene plant in the engineering stage. Completion: 1992.

300,000 mt/y MTBE plant in the engineering stage. Completion: 1992.

POLYPROPYLENE MALAYSIA. Kuantan. (joint venture with Petronas, Idemitsu Petrochemical, and Neste Oy) 80,000 mt/y polypropylene plant. Engr: Stone & Webster. Contr: Toyo Engr. Corp. Completion: 1992.

SHELL MDS (MALAYSIA). Bintulu. 500,000 mt/y middle distillates synthesis. Contr: JGC. Completion: 1992.

TITAN POLYPROPYLENE (MALAYSIA) Sdn. Bhd. Johor. 100,000 mt/y polypropylene. De-

sign: Tecnimont. Contr: JGC. Completion: 1991.

200,000 mt/y ld & hd polyethylene plant. Completion: 1993.

Pasir Gudang. 230,000 mt/y ethylene Feedstock: Naphtha and LPG. Tech: Stone & Webster. Contr: JGC Corp. Completion: June 1993.

115,000 mt/y propylene plant. Feedstock: Naphtha and LPG. Tech: Stone & Webster. Completion: June 1993.

200,000 mt/y polyethylene plant in the engineering stage. Contr: Mitsubishi. Completion: June 1993.

MEXICO

CELANESE MEXICANA. Cangrejera, Veracruz. 60,000 mt/y vinyl acetate plant. Feed: Ethylene, acetic acid. Completion: 1991.

100,000 mt/y butyraldehyde, 5,400 mt/y isobutyraldehyde units. Feed: Propylene. Completion: 1991.

30,000 mt/y acrylic acid plant. Feed: propylene. 4,600 mt/y polyester expansion. Completion: 1991.

DERIVADOS MALEICOS SA DE CV. Apizaco, Tlaxcala. 15,000 mt/y maleic anhydride unit. Feed: Benzene. Completion: End 1992.

Morelos, Veracruz. 30,000 mt/y maleic anhydride plant under construction. Completion: 1992.

FERTILIZANTES MEXICANOS. Camargo. 1,500 mt/d urea plant. Engr: Latisa. Contr: Snamprogetti. Completion: 1992.

Lazaro Cardenas. 1,500 mt/d urea plant under construction. Engr: Latisa. Contr: Snamprogetti. Completion: 1992.

INDALPRO. Altamira. 100,000 mt/y polypropylene plant. Completion: 1991/92.

Tampico. 100,000 mt/y polypropylene plant under construction. Contr: Tecnimont. Completion: 1991.

PEMEX. Camargo, Chih. 445,000 mt/y ammonia 2 unit under construction. Lic/Engr: Kellogg. Completion: Delayed.

Cadereyta, Nuevo Leon. 600,000 mt/y of paraxylene, ortho-xylene and benzene in the engineering stage. \$500 MM. Engr: Badger. Completion: 1994.

La Cangrejera, Ver. 75,000 mt/y styrene unit in the engineering stage.

95,000 mt/y ethylbenzene unit in the engineering stage.

40,000 mt/y cumene unit in the engineering stage.

Lazaro Cardenas. 445,000 mt/y ammonia unit under construction. Lic/Engr: Kellogg. Completion: Delayed.

Morelos. 350,000 mt/y propylene unit under construction. Design: Air Products. Contr: Bufete Industrial. Completion: 1992.

100,000 mt/y butadiene unit in the engineering stage.

Pajaritos, Ver. 67,000 mt/y ethylene dichloride expansion capacity in the engineering stage.

100,000 mt/y vinyl chloride recovery unit expansion capacity in the engineering stage.

43,000 mt/y MTBE conversion from ethylene plant under construction.

Tula, Hgo. 2,000 mt/y acetonitrile unit under construction.

SINTESIS ORGANICAS SA DE CV. Apizaco, Tlaxcala. 15,000 mt/y plasticizers unit. Feed: 2-ethyl hexanol. Completion: End 1992.

TEREFTALATOS MEXICANOS. Cosoleacaque, Veracruz. 60,000 mt/y terephthalic acid expansion in the engineering stage. Engr: Bufete Industrial. Completion: 1991.

NETHERLANDS

DSM. Herveen. 145,000 mt/y polypropylene. Completion: 1991.

SHELL NEDERLAND CHEMIE BV. Moerdijk, Netherlands. 363,000 mt/y ethylbenzene plant in the engineering stage. Tech: Mobil/Badger. Contr: KTI. Completion: Late 1991.

64,000 mt/y styrene propylene oxide and 25,000 mt/y propylene. Engr: Fluor Corp. Completion: Late 1991.

NIGERIA

NIGERIA LNG Ltd. Rivers State. 4 million mt/y LNG. Technip/Snamprogetti Spa Tealarc liquefaction process. \$2.5 billion. Specification preparation: Technip/Kellogg. Completion: 1993.

NIGERIAN NATIONAL PETRO. Co. Eleme, Port Harcourt. phase two of petrochemical complex. 270,000 mt/y ld & hd polyethylene, 80,000 mt/y polypropylene, 260,000 mt/y ethylene, 82,000 mt/y propylene and 20,000 mt/y butadiene plant. \$1.2 billion. Engr: Stone & Webster. Contr: Du Pont Canada/IFF. Completion: 1993.

80,000 mt/y polypropylene plant in the engineering stage. Lic: Himont. Contr: JGC Corp.

*22,000 mt/y butenes plant in the engineering stage. Engr: Stone & Webster. Contr: IFF. Completion: 1993.

NORWAY

Statoil. Antwerp. 180,000 mt/y polypropylene unit. Completion: 1991.

PETROCHEMICAL

Den norske stats oljeselskap AS, Bamble. 40,000 mt/y expansion of their hd polyethylene plant. \$23.9 MM.

OMAN

Oman government. 2,220 mt/y floating methanol plant. \$250 MM. Tenders out. Completion: 1991.

PAKISTAN

QAWOOD HERCULES, Shekhupura. 815 mt/d ammonia, 1,350 mt/d urea revamp and expansion under construction. Engr/Contr: Kellogg. Completion: 1991.

FAUJI FERTILIZER Co., Machhi Goth. 1,100 mt/d ammonia expansion and 1,925 mt/d urea expansion under construction. Design/Engr/Contr: Snamprogetti. Completion: 1992.

PHILIPPINES

COLUMBIAN CARBON PHILIPPINES Inc., Bataan. 2,000 mt/y carbon black expansion planned. Completion: 1991.

LUZON PETROCHEMICAL Corp., Batangas. 140,000 mt/y hd and hd polyethylene, 110,000 mt/y of polypropylene plant. Contr: Mitsubishi Corp. Tech: Unipol process. (joint venture lead by USI Far East Corp.)

230,000 mt/y ethylene plant in the engineering stage. Contr: Toyo Engineering Corp./Nissho Iwai Corp. Completion: Late 1992.

POLAND

ZAKLADY AZOTOWE PU-LAWY, Pulawy. 1,700 mt/y urea expansion in the engineering stage. Contr: Technimont. Completion: 1993.

PORTUGAL

CIA NACIONAL PETROCHEMICA'S, Sines. 50,000 mt/y ethylene cracker. Completion: 1992.

EMPRESA DE POLIMEROS DE SINES, Sines. 40,000 mt/y hd polyethylene expansion and build a compounding unit on the site. Completion: 1992.

NESTE OY/PETROGAL, Sines. 50,000 mt/y MTBE and 200,000 mt/y alkylates plant. Completion: 1994.

QATAR

QATAR FERTILIZER Co., Umm Said. 1,000 mt/d ammonia and 2,000 mt/d urea.

*300,000 mt/y ethylene expansion under study.

*170,000 mt/y polyethylene expansion under study.

SAUDI ARABIA

AMOCO AND SAUDI CHEMICAL INVESTMENTS Ltd., feasibility study of building an aromatics complex. 400,000 mt/y paraxylene plant and a BTX extraction unit.

ARABIAN PETROCHEMICAL Co., Al Jubail. 133,000 mt/y benzene plant in the engineering stage. Design: Air Products. Completion: 1991.

500,000 mt/y ethylene project under construction. Lic: Kellogg. Contr: Mitsui. Completion: 1993.

300,000 mt/y propylene under construction. Completion: 1993.

100,000 mt/y butadiene under construction. Completion: 1993.

70,000 mt/y benzene-toluene-xylene under construction. Completion: 1993.

EASTERN PETROCHEMICAL Co., 330,000 mt/y ethylene glycol and 140,000 mt/y polyethylene expansion under construction. Contr: Chiyoda Corp.

IBN HAYYAN, Al Jubail. 100,000 mt/y polyvinyl chloride expansion under construction. Contr: Badger. Completion: 1991.

MOBIL CHEMICAL Co./SAUDI BASIC INDUSTRIES Corp., Yanbu. Installation of 2 ethylene furanics, 50,000 mt/y polyethylene and 80,000 mt/y ethylene glycol expansion.

NATIONAL PETROCHEMICAL Co., Al-Jubail. 100,000 mt/y polyvinyl chloride expansion under construction. Contr: Badger.

PETROKEMYA, Al Jubail. 500,000 mt/y ethylene project in the engineering stage. Lic: Kellogg. Engr: Heurtey Petrochem Engr. Completion: 1993.

SAUDI ARABIAN FERTILIZER Co., Jubail. 500,000 mt/y ammonia and 600,000 mt/y urea plant. Contr: Chiyoda Corp. Completion: 1992.

SAUDI BASIC INDUSTRIES Corp., Jubail. 500,000 mt/y MTBE plant planned.

200,000 mt/y garassroots polypropylene plant planned. Tech: Union Carbide. Completion: Early 1993.

SAUDI EUROPEAN PETROCHEM Co., Al-Jubail. 700,000 mt/y MTBE and 200,000 polypropylene plant under construction. Lic: Lummus Crest. Contr: Snamprogetti. Completion: 1993.

SAUDI METHANOL Co., Al-Jubail. 700,000 mt/y MTBE plant in the engineering stage. Lic: Lummus Crest. Completion: 1993.

SAUDI PETROCHEMICAL Co., Al-Jubail. *54,000 mt/y styrene expansion planned.

SINGAPORE

CHINA AMERICAN PETROCHEMICAL Co., Pulau Ayer Chawan. (joint venture with Amoco Corp. and Exxon Corp.) 350,000 mt/y paraxylene plant and aromatics complex.

MOBIL CORP., Jurong. *190,000 mt/y cyclohexane plant in the engineering stage. Engr: Badger. Contr: IFP. Completion: 1992.

*300,000 mt/y paraxylene, benzene, cyclohexane, orthoxylene and solvents in the engineering stage. \$600 MM. Engr/Contr: Badger. Completion: 1993.

SOUTH AFRICA

NATIONAL CHEMICAL PRODUCTS Ltd., Durban. 6,000 mt/y maleic anhydride plant under construction. Feed: Butane. \$17 MM.

SASOL Ltd., Sasolburg. *240,000 mt/y ammonia plant. Contr: Uhde GmbH. Completion: Mid-1993.

SASTECH, Sasolburg. 730 mt/d ammonia plant under construction. Contr: Uhde GmbH. Completion: 1993.

SPAIN

ATOCHM, El Prat de Llobregat. 120,000 mt/y polyvinyl chloride plant. \$60 MM. Completion: 1991.

25,000 mt/y polystyrene expansion (75,000 mt/y total cap).

BASF, Tarragona. 50,000 mt/y polypropylene plant. Completion: 1991.

BAYER HISPANIA INDUSTRIAL SA, Tarragona. Expansion of the following: 36,000 mt/y isocyanates, 11,000 mt/y ABS/SAN resins, 1,200 mt/y synthetic latex. \$80 MM. Completion: 1991.

BP CHEMICALS LTD./CIA, ESPANOLA DE PETROLEOS SA, San Roque. 30,000 mt/y maleic anhydride plant. \$50 MM. Completion: 1991.

Algeciras. 45,000 mt/y MTBE unit. Lic: UOP.

E.I. du PONT de NEMOURS INC., Barcelona. polymers/composite materials plant. \$80 MM. Completion: 1992.

Oviedo, Asturias. \$1 billion petrochemical complex to produce engineering plastics, advanced fibers, and other products. Completion: 1992.

ERTOIL SA, Huelva refinery. 30,000 mt/y propylene plant under construction. Completion: 1992.

GE PLASTICS DE ESPANA SA, Cartagena. acrylonitrile butadiene styrene plant. \$2.5 billion. Contr: Foster Wheeler Iberia SA.

HISPAVIC-SOLVAY, Marforneli. 55,000 mt/y polyvinyl chloride under construction. Contr: Tecnica. Completion: 1992.

REPSOL PETROLEO, Bibao. 100,000 mt/y polypropylene plant. Completion: 1992.

Gajano. 60 m³/h carbon black and 150 m³/h synthetic rubber under construction. Contr: Tecnica. Completion: End 1991.

La Coruna. 160,000 mt/y hydrogenation butadiene plant. Completion: 1991.

Puertollano. 130,000 mt/y alkylation unit. Contr: Phillips. Completion: 1991.

Tarragona. 27,000 mt/y propylene plant. Completion: 1991.

70,000 mt/y ethylene expansion. Engr: Linde. Completion: Mid-1992.

REPSOL QUIMICA SA, Puertollano. *20,000 mt/y hd polyethylene expansion.

TARRAGONA QUIMICA SA, Tarragona. 25,000 mt/y hd polyethylene expansion (125,000 mt/y total cap.) \$65 MM.

SWEDEN

STATOIL PETROKEMI AB, Stenungsund. 49,000 mt/y MTBE plant under construction. Design: Snamprogetti. Completion: 1991.

THAILAND

CHIEM PATTANA KNITTING Co. Ltd., Ratchaburi. 42,000 mt/y polyester polycondensation in the engineering stage. Contr: Zimmer. Completion: 1992.

DOW CHEMICAL, Rayong province. 25,000 mt/y polyurethane plant. Completion: 1992.

ICI INDUSTRIES plc/SAHA UNION, Rayong province. (joint venture) 205,000 b/d purified terephthalic acid plant planned. Completion: 1992.

PETROLEUM AUTHORITY OF THAILAND, Rayong. Petrochemical complex 2: 500 MM lb/y aromatics and olefins. Engr. study/Contr: Bechtel/Chem Systems. \$1 billion. Completion: 1992.

SUN FLAG (THAILAND) Ltd., Aythaya. 3,650 mt/y polyester resins in the engineering stage. Contr: Davy McKee. Completion: 1992.

35,000 mt/y polyester polycondensation plant in the engineering stage. Contr: Zimmer. Completion: 1992.

THAI CHAROEN POKPHAND GROUP, Ma Ta Phut. (joint venture with Solvay Group) 135,000 mt/y polyvinyl chloride plant. Contr: Solvay.

THAI OLEFINS Co., Rayong province. 350,000 mt/y ethylene and 170,000 mt/y propylene plant. Engr: Bechtel. Completion: Mid-1993.

PETROCHEMICAL

Map Ta Phut. 600,000 mt/y NPC-2 olefins plant in the engineering stage. \$500 MM. Engr: Stone & Webster. Completion: 1993.

*350,000 mt/y ethylene unit in the engineering stage. Lic/Engr: Stone & Webster. Completion: 1994.

TPI Rayong. 15,000 mt/y polystyrene plant in the engineering stage. Engr: Uhde GmbH.

TRINIDAD

CARIBBEAN METHANOL Co. Point Lisas. 550,000 mt/y methanol plant in the engineering stage. Contr: Davy Powergas. Completion: 1992.

FERTIR. *1,500 mt/d ammonia plant upgrade in the engineering stage. Engr: Kellogg. Completion: 1992.

FERTILIZERS OF TRINIDAD AND TOBAGO Ltd. Point Lisas. 180 mt/d expansion of their ammonia plant. Completion: Mid-1993.

GOVERNMENT OF TRINIDAD-TOBAGO (51%), MW KELLOGG (24.5%), NORSE HYDRO (24.5%). Point Lisas. 1,500 mt/d ammonia plant. Contr: Kellogg.

TRINIDAD & TOBAGO METHANOL Co. 1,380 mt/d methanol revamping in the engineering stage. Contr: Toyo Corp. Completion: 1992.

TUNISIA

IMPOL. Hamman Lij. 44,000 mt/y polystyrene plant in the engineering stage. Engr: Technimont. Completion: 1992.

TURKEY

PETKIM, Allage. 140,000 mt/y polyvinyl chloride expansion in the engineering stage. Engr: CTIP. Process: Solvay. Completion: 1992.

*Ethylene expansion in the engineering stage. Lic/Engr: Stone & Webster. Completion: 1992.

*14,000 mt/y polypropylene expansion. Completion: 1993.

*15,000 mt/y hd polyethylene expansion. Completion: 1992.

*16,000 mt/y hd polyethylene expansion. Completion: 1992.

*25,000 mt/y vinyl chloride monomer expansion. Completion: 1993.

POLIPET. Gaziantep. 80,000 mt/y polypropylene plant. Completion: 1991/92.

TURKIYE GUBRE SANAYII.

Gemlik. 1,000 mt/d ammonia plant under construction. Lic/Engr: Kellogg. Completion: 1991.

UNITED KINGDOM

BP CHEMICALS Ltd. Barry. Pheolics resins plant under construction. Contr: John Brown. Completion: 1991.

Hull, Grangemouth, Scotland. 350,000 mt/y ethylene unit under construction. Lic/Engr: Stone & Webster. Completion: 1992.

100,000 mt/y hd polyethylene expansion in engineering stage (250,000 mt/y total capacity).

EXXON CHEMICAL Ltd. Fawley. Higher olefins plant under construction. Engr/Contr: Snamprogetti. Completion: 1991.

Fife Hiking ethylene capacity to 900,000 mt/y and adding a polymer grade propylene capacity of 180,000 mt/y \$315 MM. Completion: 1992.

EXXON/SHELL. Mossmorran, Scot. 250,000 mt/y ethylene expansion postponed. Engr: Kellogg.

SHELL CHEMICALS U.K. Ltd. Carrington. 100,000 mt/y hd polyethylene and 130,000 mt/y polypropylene plant in the engineering stage. Engr/Contr: Kellogg. Completion: 1992.

***Glanford.** 30,000 mt/y polyester solid state polycondensation in the engineering stage. Contr: Zimmer. Completion: 1992.

Stanlow. *Ethylbenzene expansion under construction. Completion: 1994.

U.S.S.R.

Kazan. 200,000 mt/y polyethylene expansion. Tech: Union Carbide. Contr: John Brown.

MINISTRY OF THE PETROCHEMICALS INDUSTRY AND ENI, Lithuania. (joint venture) 350,000 mt/y MTBE and 150,000 mt/y alkylates plant planned.

Nizhnevartovsk, Siberia. petrochemical complex. Feed: Ethylene. \$5 billion. Feasibility study: Mitsubishi/Mitsui/Chiyoda Corp. Completion: Late 1990's.

P.O. CHLORVINYL. Kalusch. 370,000 mt/y vinyl chloride monomer expansion. Engr: Uhde GmbH. Completion: 1994.

PRESSINDUSTRIA. Tobolsk. 90,000 mt/y butyl rubber plant in the engineering stage. Contr: Technimont. Completion: June 1993.

SOJUZAGROKHIMEXPORT. Chirchik. 8,000 mt/y caprolac-

tam expansion in the engineering stage. Engr: SNIA. Completion: 1992.

SOVIET MINISTRY OF THE CHEMICAL INDUSTRY. Shevchenko. Petrochemical complex. Contr: Dow Europe-Litwin. Feasibility study.

STAVROPOL POLYMER. Budyennovsk. 100,000 mt/y expansion of their olefin plant in the engineering stage. Tech: Linde. Completion: 1992.

TECHMASHIMPORT. Budennovsk, Caucasus. 100,000 mt/y ethylene expansion at Stavropol polymer complex. Contr: Linde AG.

Budyennovsk. 100,000 mt/y polypropylene plant under construction. \$175 MM. Contr: John Brown. Completion: 1991.

polyethylene expansion under construction. Engr/Contr: John Brown. Completion: 1991.

Blagoveshchensk. 230,000 mt/y pure terephthalic acid in engineering stage. Contr: MES. Completion: 1992.

Dzerzhinsk. 40,000 mt/y acrylic monomer and 40,000 mt/y acrylic emulsion plant under construction. Contr: Mitsubishi.

Mogilev. 25,000 mt/y dimethyl terephthalate modernization, expansion under construction. Contr: Krupp's Koppers. Completion: 1993.

Saratov. 75,000 mt/y acrylonitrile expansion in the engineering stage. Contr: Technimont. Completion: 1991.

Voronej. 30,000 mt/y thermoplastic styrene-butadiene elastomers plant planned. Contr: Litwin SA France. Completion: 1991.

500,000 mt/y ethylene revamping. Contr: Toyo Engineering Corp.

TOBOLSK. W. Siberia. 457,000 mt/y propylene plant.

VENEZUELA

DOW CHEMICAL Co. El Tablazo. 150,000 mt/y styrene monomer plant. \$120 MM. (joint venture with Petroquímica de Venezuela and Grupo Zuliano).

NITRORIENTE. Anzoategui. 495,000 mt/y ammonia unit. Lic/Engr: Braun. \$250 MM. Completion: 1991.

PEQUIVEN. Moron Complex. 500,000 mt/y ammonia and 500,000 mt/y urea expansion.

El Tablazo, Zulia. Olefins plant expansion (250,000 mt/y ethylene and 125,000 t/y propylene) in the engineering stage. Feed: Ethane. Engr/Contr: Ineletra/Kellogg. Completion: 1991.

150,000 mt/y ethylene dichloride unit under construction. Contr: Uhde GmbH. Completion: 1991.

Morón, Carabobo. 495,000 mt/y ammonia unit planned. Lic/Engr: Braun. Feed: Natural gas. Completion: 1991.

247,500 mt/y urea unit planned. Feed: Ammonia. Completion: 1991.

308,000 mt/y solution urea. Feed: Ammonia. Planned. Completion: 1991.

Zulia Complex. 60,000 mt/y ethylene glycol, 16,000 mt/y ethylene oxide, 150,000 mt/y styrene, 150,000 mt/y polyethylene, 70,000 mt/y polypropylene, 120,000 mt/y polyvinyl chloride, 350,000 mt/y ethylene and 130,000 mt/y propylene expansion.

110,000 mt/y ethylene dichloride unit under construction. Contr: Uhde GmbH. Completion: 1991.

130,000 mt/y vinyl chloride monomer unit under construction. Contr: Uhde GmbH. Completion: 1991.

PEQUIVEN/ECOFUEL. Jose. 2,000 mt/d methanol plant in the engineering stage. Engr: Davy McKee. Completion: 1993.

PETROPROPANO DE VENEZUELA SA Jose. (joint venture of Petroquímica de Venezuela and Veba Oel AG) 250,000 mt/y propylene unit. Feed: Propane. Engr/Design: UOP.

PRALCA. Punta Camacho, Estado Zulia. 16,000 mt/y purified ethylene oxide, 72,000 mt/y ethylene glycol, 66,000 mt/y monoethylene glycol, 6,300 mt/y diethylene glycol, 290 mt/y triethylene glycol in the engineering stage. Contr: TPL. Completion: Sept. 1992.

SUPER OCTANOS CA Jose. 320,000 mt/y isobutylene plant under construction. Design: Air Products. Completion: 1991.

VIET NAM

GOVERNMENT. \$600-800 MM petrochemical complex. Completion: 1995.

YUGOSLAVIA

JUGOVINIL. Kastei Sucurac, Split. 85,000 mt/y polyvinyl chloride in the engineering stage. Feed: vinyl chloride monomer.

PRVA ISKRA. Baric, Belgrade. 20,000 mt/y toluene plant. Feed: Natural gas, toluene.

50,000 mt/y linear alkylbenzene plant. Feed: N-paraffins, benzene.

Sulfur—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

ASHLAND PETROLEUM. St. Paul, Minn. 50 t/d claus unit (from refinery). Engr: Pritchard/Pro Quip. Completion: Fall 1992.

Canton, Ohio. 50 t/d claus unit (from refinery). Engr: Pritchard/Pro Quip. Completion: Summer 1992.

Catlettsburg, Ky. 203.2 claus unit (from refinery). Contr: Foster Wheeler. Engr: Pritchard. Completion: Dec. 1991.

CENEX FARMERS UNION. Laurel, Mont. Sulfur recovery unit upgrade. Completion: Mid-1994.

CHEVRON U.S.A. Salt Lake City, Utah. Desulfurization unit. \$40MM. Contr: Fluor Daniel. Completion: July 1993.

FINA OIL & CHEMICAL Co. Big Spring, Tex. 60 mt/d claus/Scot expansion (from refinery gas). Contr: Pro Quip. Completion: 1st Qtr. 1992.

FRONTIER OIL Corp. Cheyenne, Wyo. 55 t/d expansion (from refinery). Completion: 2nd Qtr. 1992.

HOLLY Corp. Artesia, N.M. Sulfur recovery unit. \$12 MM.

LOUISIANA LAND & EXPLORATION Co. Thermopolis, Wyo. 200 mt/d claus/Scot expansion (from natural gas). Contr: Stearns-Roger. Completion: March 1992.

MARATHON OIL Co. Robinson, Ill. 180 t/d claus & tailgas units. Design: Parsons. Contr: Kellogg. Completion: 1993.

Detroit, Mich. 45 t/d claus & tailgas units. Contr: Fluor. Completion: 1993.

Garyville, La. tailgas unit. Contr: Kellogg. Completion: 1993.

MOBIL OIL Corp. Beaumont, Tex. 300 mt/d claus unit (from refinery gas). Contr: Kellogg. Completion: Mid-1992.

Joliet, Ill. 200 t/d claus & tailgas unit (from refinery). Contr: Litwin. Completion: 1993.

PHILLIPS PETROLEUM. Woods Cross, Utah. 10 t/d sulfur plant in the engineering stage. Engr: Bechtel. Completion: 1992.

STAR ENTERPRISE. Port Arthur, Tex. 152 t/d sulfur plant and 200 t/d tail gas unit under construction. Engr/Design: Bechtel. Contr: Brown & Root. Completion: 1993.

SUN REFINING & MARKETING Inc. Tulsa, Okla. 52 t/d sulfur plant in the engineering stage. Engr: Parsons. Completion: 4th Qtr. 1992.

TEXACO Inc. Bakersfield, Calif. 70 t/d sulfur recovery unit and 100 t/d tail gas treating unit under construction. Engr/Design: Bechtel. Contr: Fluor Daniel. Completion: July 1993.

El Dorado, Kan. 130 t/d sulfur recovery unit and 130 t/d tail gas treating unit. Contr: TPA/Cherne. Completion: Aug. 1992.

Anacortes, Wash. 60 t/d sulfur recovery unit and 70 t/d tail gas treating unit. Contr: Fluor Daniel. Completion: July 1993.

TOTAL PETROLEUM Inc. Aima, Mich. 40.7 t/d claus unit (from refinery). Completion: March 1993.

UNOCAL. Wilmington, Calif. 200 t/d sulfur recovery and tailgas unit in the engineering stage. Lic/Engr: Parsons. Contr: Bechtel. Completion: Late 1993.

ABU DHABI

ABU DHABI GAS LIQUEFACTION Co. Ltd. Das Island. 90 mt/d upgrade of two sulfur recovery units in the Persian Gulf. Engr: Parsons. Completion: Sept. 1992.

ABU DHABI NATIONAL OIL Co. Ruwais. 500 mt/d each, 2 units sulfur granulation being revamped and under construction. Contr: Snamprogetti. Completion: 1991.

750 mt/d sulfur granulation unit under construction. Contr: Snamprogetti. Completion: 1991.

Umm Al-Nar. 23 mt/d sulfur recovery plant under construction. Contr: Snamprogetti. Completion: 1992.

AUSTRALIA

BP REFINERY KWINANA. Kwinana. 35 t/d sulfur recovery unit. Contr: Pritchard. Completion: 1992.

BRAZIL

PETROBRÁS. Canoas, RS. 70 mt/d claus unit (from refinery) planned. Contr: Staff. Completion: 1994.

Cubatão, SP. 70 mt/d claus unit (from refinery). Contr: Staff. Completion: 1993.

Paulínia, SP. 60 mt/d claus unit (from fuel gas and LPG desulf) under construction. Lic: Kellogg. Contr: Staff. Completion: 1993.

Sao Matus Do Sul, PR. 65 mt/d sulfur plant under construction. Completion: 1991.

CANADA

HUSKY OIL OPERATIONS. Lloydminster, Alta/Sask. 290

mt/d heavy oil upgrader sulfur recovery plant in the engineering stage. Engr/Procurement: Monenco Ltd. Completion: Nov. 1992.

MOBIL OIL CANADA. Carstairs, Alta Sulfur recovery unit. Superclaus-99 process.

SHELL CANADA. Caroline, Alta. 300 MMcfd expansion of 4,500 mt/d plant in engineering stage. Engr: Shawinigan. Contr: Petrotech Lavalin. Completion: 1991.

4,000 mt/d sulfur recovery unit under construction. Engr/Contr: Delta Projects. Completion: 1993.

WESTCOAST ENERGY Inc. Fort St. John. Sulfur recovery unit. Contr: Fluor Daniel. Completion: Late 1991.

CHINA

PANZHUIHUA IRON & STEEL WORKS. Dukou. 8,000 mt/y sulfuric acid plant under construction. Contr: Krupp Koppers. Completion: 1991.

TANGSHAN MUNICIPAL COKING PLANT. Tangshan. 1,300 mt/y sulfur plant in the engineering stage. Contr: Krupp Koppers. Completion: 1994.

COSTA RICA

REFINADORA COSTARRICENSE DE PETROLEO. Puerto Limon. 10,000 mt/d sulfur plant in the engineering stage. Contr: Dragados. Completion: 1992.

CYPRUS

BP CYPRUS. 12 mt/d sulfur recovery unit expansion under construction. Design/Engr: Parsons. Completion: 4th Qtr. 1991.

GERMANY

LEUNA-WERKE. Leuna. 9,400 Nm³/h sulfur recovery unit under construction. Contr: Voest-Alpine. Completion: 1992.

RUHRKOHLE AG. Dortmund. 10,000 mt/y sulfur plant under construction. Contr: Krupp Koppers. Completion: 1992.

INDIA

HINDUSTAN PETROLEUM CORP. Visakhapatnam. 20,000 mt/d sulfur plant in the engineering stage. Completion: 1991.

INDIAN OIL Corp. Ltd. Koyali, Gujarat. 18 mt/d claus unit (from fuel gas). Completion: Oct. 1992.

Haldia, West Bengal. 15 mt/d claus unit (from fuel gas). Completion: July 1992.

IRAN

NATIONAL IRANIAN OIL Co. Bandar Abbas. 130 mt/d sulfur recovery plant under construction. Design/Engr/Contr: Snamprogetti. Completion: 1994.

ISRAEL

OIL REFINERIES Ltd. Ashdod. 60 mt/d Super Claus TGT unit. Feed: FCC. Completion: Jan. 1992.

ITALY

AGIP PETROLI. Treccate. 2.2 mt/d Local sulphur removal. Lic: ARI Tech. Completion: 1991.

ENICHEM. Augusta. 4 mt/d Local sulphur removal. Lic: ARI Tech. Completion: 1991.

SARAS. Sarroch. 200 mt/d sulphur recovery unit in the engineering stage. Engr: Techint. Completion: 1992.

JORDAN

JORDAN PETROLEUM REFINERY. Zarka. 18 mt/d claus unit from refinery gases. \$4.5 MM. Completion: 1992.

KOREA

KUKDONG. Daesan. 180 mt/d claus unit. Contr: Hyundai. Completion: Dec. 1992.

MEXICO

PEMEX. Salina Cruz, Oax. 32.9 mt/d claus unit (from refinery gas) under construction. Completion: 1991.

40 mt/d claus unit (from refinery gas) under construction.

40 mt/d claus unit (from refinery gas) under construction.

Tula, Hgo. 32.9 mt/d claus unit (from refinery gas) under construction. Completion: 1991.

NETHERLANDS

DSM. 500 mt/d sulfur dioxide plant under construction. Completion: 1992.

QATAR

QATAR GENERAL PETROLEUM Corp. Umm Said. 145 mt/d expansion under construction. Completion: 1992.

SPAIN

REPSOL PETROLEO. Cartagena. 70 t/d sulfur recovery unit in the engineering stage. Engr/Contr: Tecnicas. Completion: End 1991.

SULFUR

TRINIDAD

***TRINIDAD & TOBAGO OIL Co. Ltd. Pointe-A-Pierre.** 150 mt/d new claus unit. Engr: Kellogg. Completion: 1992.

TURKEY

TURKISH PETROLEUM REFINERIES Corp. Izmir. 70 mt/d sulfur recovery plant (from refinery gas) under construction.

Contr: Snamprogetti. Completion: 1993.

Izmit. 90 mt/d claus and tail gas unit (from refinery gas). Completion: 1995.

Kirikale. 48 mt/d claus unit (from refinery gas). Contr: JGC/Kutlutas. Completion: 1992.

UNITED KINGDOM

OCCIDENTAL PETROLEUM.

North Sea. 150 MMscfd H₂S removal from natural gas. Lic: SNEA. Completion: 1991.

U.S.S.R.

MACHINOIMPORTS, Tengiz. 3 sulfur recovery units. 256,000 mt/y each in the engineering stage. Lic: IFP. Contr: Lurgi/Tal. Completion: 1992.

VENEZUELA

LAGOVEN, SA Amuay. 360 mt/d sulfur recovery unit in the engineering stage. Engr: Parsons. \$31.5MM. Completion: 1993.

***MARAVEN, Cardon.** 230 mt/d claus unit. Engr/Contr: Jantesa/Comprimo. \$7.6 MM. Completion: 1993.

Gas Processing—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

AMERADA HESS, Tioga, N.D. expansion of treating facility under construction.

ARCO ALASKA, Inc. Prudhoe Bay, Alaska. 2.4 bscfd gas handling facilities reinjection expansion in the engineering stage. Design/Engr: Parsons. Completion: 4th Qtr. 1994.

EL PASO NATURAL GAS Co. West Tex. upgrade of compressor station in the engineering stage. Design: Fish. Completion: 1992.

***ENTERPRISE PRODUCTS Co. Mont Belvieu, Tex.** 30,000 b/d NGL fractionator expansion. Completion: 2nd Qtr. 1992.

EXXON Co. Mobile Bay, Ala. 300 MMscfd sour gas treatment plant under construction. Contr: Zachry. Completion: June 1993.

JAVELINA Corp. Corpus Christi, Tex. 135 MMscfd refinery off-gas processing expansion under construction. Engr/Contr: Fisil. Completion: 1991.

MAXUS ENERGY Corp. Texas Panhandle. 160 MMcfd natural gas processing plant. Contr: Randall. Completion: Jan. 1993.

MOBIL, Beaumont, Tex. 4 new units and 5 revamps to improve C₃ reformate in the engineering stage. Engr/Contr: Kellogg. 1992.

***NORTHWEST PIPELINE Corp. Opal, Wyo.** 150 MMscfd cryogenic gas processing expansion in the engineering stage. Engr: Fish. Completion: 1991.

PANHANDLE EASTERN Corp. Liberal, Kan. \$25 million upgrade to extract 800 MMcfy of crude helium. (joint venture with Air Products & Chemicals Inc.).

PHILLIPS PETROLEUM Co. Tulsa, Okla. boost compression at its 25 MMcfd Creek gas processing plant including two 1,160 hp compressors. Planning.

SHELL OFFSHORE INC. Mobil, Ala. 200 MMcfd sour gas treatment/processing plant. The plant will yield 60 long t/d of

sulfur and some natural gas liquids. \$55 MM. Engr: Davy McKee/BE&K Inc. Contr: John Brown. Completion: Nov. 1991.

***VALERO NATURAL GAS PARTNERS LP, Freer, Tex.** increase capacity of their gas processing plant to more than 300 MMcfd. Completion: Feb. 1992.

YUKON PACIFIC, Anderson Bay, Alaska. 2,000 MMscfd LNG plant in the engineering stage. Engr: Bechtel. Completion: 1997.

ABU DHABI

***ABU DHABI GAS INDUSTRIES. BuHassa.** Upgrade of their second gas processing train. Contr: Stone & Webster. Completion: Mid-1992.

ALGERIA

SONATRACH, Bethioua near Arzew. 1 billion cfd revamp LNG2 natural gas liquefaction complex. Engr/Contr: Kellogg. Completion: 1995.

***Guellala.** 500 mt/d LPG recovery plant under construction. Contr: Mitsubishi. Completion: Dec. 1992.

Hassi Messaoud Sud. 832,000 mt/y LPG plant planned.

Hassi Messaoud Nord. 485,000 mt/y LPG plant planned.

Rhoude Chouff. 7 MMcum/d gas gathering and conditioning under construction. Engr/Design: Snamprogetti. Completion: 1994.

AUSTRALIA

SAGASCO, Beharra Springs, WA. 20 MMcfd plant in the engineering stage. Engr: Davy McKee. Completion: 1992.

WOODSIDE OFFSHORE PETROLEUM pti. Withnell Bay, Burrup Peninsula (near Karatha). 2 MM mt/y LNG train No. 3 in design stage. 6 MM tons LNG total capacity. Engr/Contr: Kellogg/JGC. Completion: 1993.

BANGLADESH

BAKHRABAD GAS SYSTEMS Ltd. Feni gas field. 40

MMscfd solid desiccant gas dehydration plant planned.

***PETROBANGLA, Kailash-tilla.** 5,000 mt/y LPG plant under construction. Contr: Penspen. Completion: 1992.

BRAZIL

PETROBRAS, Amazonas. 21.2 MMcfd gas processing plant in the design stage. (47,000 g/d LPG, 2,900 g/d C₃) Contr: Pro-pak. Completion: April 1992.

Cubatão. 77.3 MMcfd gas processing plant in the design stage. Contr: Pecten. Completion: June 1992.

Rio Grande Do Norte. 38.8 MMcfd gas processing plant planned. 152,100 gal/d LPG, 26,900 gal/d C₃. In-house. Completion: Jan. 1995.

CANADA

AMOCO CANADA PETROLEUM Co. Ltd. West Pembina, Alta. 35 MMcfd natural gas plant expansion to 95 MMcfd in the engineering stage. Completion: 1991.

SHELL CANADA, Caroline, Alta. 300 MMcfd expansion under construction. \$500 MM. EPC: Delta Projects Inc. Completion: 1993.

sour gas processing pilot plant. Contr: Cana Construction Ltd.

TOTAL PETROLEUM CANADA Ltd. Spirit River, Alta. Locat hydrogen sulfide oxidation process unit. Contr: Colt Engineering.

WESTCOAST ENERGY Inc. Fort St. John, B.C. 105 MMcfd expansion of its gas processing plant in the engineering stage. Contr: Fluor Corp. Completion: Late 1991.

CHINA

Shenzhen City, Guangdong. \$150 MM processing complex. Capacities will be 86,200 mt/y LPG, 70,000 mt/y polypropylene, 100,000 mt/y gasoline.

CHINA NATIONAL TECHNICAL IMPORTS Corp. Puyang. 75 MMcfd NGL recovery plant in the engineering stage. Engr: CTIP.

CHINA OFFSHORE OIL DEVELOPMENT & ENGINEERING Co. Jinxi. 60 MMscfd gas processing plant under construction. Contr: Hudson Engr. Completion: May 1992.

SHOUDU IRON & STEEL Co. Seijing. 1.1 mt/d coal gasification plant. Engr: CTIP.

CHINA, HONG KONG

HONG KONG AND CHINA GAS Co. Tai Po. 1,400 cum/d expansion of British Gas gas process under construction. Contr: Babcock. Completion: 1992.

EGYPT

AGIP SpA, El Qar'a. 500 mt/d gas gathering and conditioning plant under construction. Design: Snamprogetti. Completion: 1991.

300 mt/d ethane, LPG, 800 mt/d gasoline recovery under construction. Design: Snamprogetti. Completion: 1991.

BADR PETROLEUM, Western Desert. gas/oil separation in the engineering stage. Engr: Bechtel. Completion: 1991.

EGYPTIAN GENERAL PETROLEUM Co. Ameriya. 250 MMcfd plant in engineering stage. 112,354 g/d LPG, 41,580 g/d condensate, 19 MMcfd C₂/C₃ mix. Completion: Mar. 1992.

GERMANY

VE AUBENHANDELS INDUSTRIENLAGEN IMPORTS. VEB Leunawerke. Expansion of gas circulation compressor and synthesis gas compressor. \$14 million. Engr: Mannesman Anlagenbau. Completion: Dec. 1991.

INDIA

IBP Co. Ltd. Gujarat, Assam. 122,410 mt/y of LPG and other

GAS PROCESSING

products will be produced at three plants, Gandhar and Batoda, Both in Gujarat and Lakwa, Assam.

GAS AUTHORITY OF INDIA Ltd. Auraiya, Uttar Pradesh. \$1.38 billion separation plant planned.

Bijaipur, Madhya Pradesh. gas processing plant to recover 8,000 b/d LPG.

Guna, Madhya Pradesh. \$490 MM gas processing plant planned.

MADRAS REFINERIES Ltd. Thanjavur district. 10,000 b/d gas processing plant to handle crude and associated gas from Cauvery basin fields.

OIL & NATURAL GAS COMMISSION. Gandhar and Meh-saha, Gujarat; Lakwa, Assam; offshore Krishna-Godavari basin; Agartala basin, Tripura. five gas processing plants. 500,000 mt/y LPG.

INDONESIA

ATLANTIC RICHFIELD BALI NORTH Inc. Jakarta. 350 MMscfd gas processing plant in the engineering stage. Completion: Oct. 1992.

ATLANTIC RICHFIELD INDONESIA Inc. Jakarta. 114 MMscfd bravo 2 compression & CO₂ removal in the engineering stage. Completion: 1st Qtr. 1994.

ARCO INTERNATIONAL. Pagerungan Is. 176 MMscfd gas plant in the engineering stage. Engr: Parsons. Completion: 1991.

EXXON PRODUCTION. Natuna Is. LNG plant in the engineering stage. Engr: Bechtel. Completion: 1993.

ITALY

SNAM SpA. Panigaglia. LNG expansion to 11 MM cum/d under construction. Engr: Snamprogetti. Completion: 1991.

MALAYSIA

PETRONAS. Bintulu. 100 MMscfd gas processing plant. \$750 MM. (joint venture with Royal Dutch/Shell). Planning. Yield 12,000 b/d.

Kerteh, Terengganu. 250 MMscfd expansion. 32 MMscfd ethane, 1,025 mt/d propane, 747,000 mt/d butane, 378,000 mt/d pentanes plus. Cryogenic expander method. Engr: TEC. Contr: Hyundai. Completion: Jan. 1992.

Two 250 MMscfd gas processing plants (GPP-2 & GPP-3) in the engineering stage. Consortium leader: Stone & Webster. Completion: 1992.

LIBYA

***AGIP Ltd.** 11 MM stcum/d NGL recovery under construction. Contr: Snamprogetti. Completion: 1993.

MALAYSIA

***PETRONAS.** Kerteh. 250 MMscfd natural gas plant under construction. Engr: Stone & Webster. Completion: 1992.

MEXICO

PETROLEOS MEXICANOS. Matapionche, Ver. 150 MMscfd cryogenic expander under construction. Completion: 1992.

NETHERLANDS

AMOCO NETHERLANDS PETROLEUM Co. Offshore. 500 MMscfd gas production facility. Completion: 1993.

NOGAT BV. Den Helder. Gas treatment plant in the engineering stage. Contr: Comprimo BV. (joint venture of NAM, Petroland Group and Energie Beheer Nederland.) Completion: 1991.

NEW ZEALAND

SHELL BP AND TODD OIL SERVICES Ltd. Maui, Taranaki. C₆ + expansion. Products: 43,804 g/d LP mix, 21,400 g/d condensate. Completion: Jan. 1993.

NIGERIA

NIGERIA LNG Ltd Benny Island. 4 MM tons LNG. Completion: Early 1995.

River State. LNG plant planned. Lic: Technip/Snamprogetti. Engr: Kellogg.

NIGERIA NATIONAL PETROLEUM Co. & MOBIL PRODUCING NIGERIA. Oso. 100,000 b/d gas oil separation unit in the engineering stage. Contr: JGC Corp. Completion: 1993.

***NIGERIAN AGIP OIL Co.** Ltd. Obiafu and Obrikom. Gas processing plant under construction. Contr: Randall. Completion: 1st Qtr. 1993.

OMAN

AL FURAT PETROLEUM Co. Omar field. 130 MMscfd gas plant. Completion: Mid-1991. (joint venture of Syria Shell, Shell Pecten, Deminex and Syrian Petroleum Co.)

PETROLEUM DEVELOPMENT OMAN. Yibal. 280 MMscfd

gas processing plant expansion. Contr: Comprimo BV/Nigata Engr. Completion: 2nd Qtr. 1992.

PAKISTAN

OIL & GAS DEVELOPMENT Corp. Lashari field. 30 MMscfd gas dehydration unit. TEG process.

Pirkoh field. 100 MMscfd gas dehydration unit. TEG process.

PAPUA NEW GUINEA

CHEVRON OIL. Kutubu field. gas/oil separator in the engineering stage. Engr: Bechtel. Completion: 1993.

PHILLIPS PETROLEUM. LNG plant in the engineering stage. Engr: Bechtel. Completion: 1992.

PERU

PETROLEOS DEL PERU. Aguaytia. 30 MMscfd gas, 700 b/d LPG, 600 b/d gasoline, and 800 b/d kero-diesel plant. Bidding. Completion: 1993.

Camisea-Cuzco. 1,200 MMscfd plant. 24,100 b/d LPG, 14,400 b/d gasoline, 10,100 b/d naphtha and 5,100 b/d kerosene plant. \$1,300 MM. Completion: 1995.

QATAR

NATIONAL OIL DISTRIBUTION. Umm-Said. 10,000 b/d fractionation of heavy condensate (from North Gas field) in engineering stage.

QATAR GENERAL PETROLEUM Corp. North Field development project. Arabian Gulf. 2,400 MMscfd gas plant in the engineering stage. Phase I. Engr: Bechtel. Completion: 1991.

SAUDI ARABIA

ARAMCO SERVICES Co. Southern Area. 300 MBPD gas/oil separation plant in the engineering stage. Engr/Contr: Parsons. Completion: 1994.

SAUDI ARABIAN OIL Co. Uthmaniyah. 360 MMscfd expansion of gas/oil separation facilities, #4 and #13 in the engineering stage. \$100 MM. Contr: Bechtel. Completion: 1991.

SPAIN

ENAGAS. Barcelona. LNG terminal revamping under construction. Design/Engr: Tecnicas. Completion: 1992.

SYRIA

AL-FURAT PETROLEUM Co. Tayyim field, ne Syria. (Syrian Petroleum 50%). 40 MMscfd associated gas treatment plant under construction. \$30 MM. Contr: Propak Systems-Canada. Completion: 1991.

SWEDEN

NYNAS ENERGY & CHEMICA'S COMPLEX. Nynasnamn. Texaco-gasification, gas treatment facilities in the engineering stage. Design: Uhde. Completion: 1993.

UNITED KINGDOM

AMOCO U.K. EXPLORATION Co. Offshore. 2,200 MMscfd gas dehydration platforms. Completion: 1993.

ENRON GAS PROCESSING (U.K.) Ltd. Seal Sands on Teesside. 400 MMscfd gas processing plant. £25 MM. Contr: Costain Engr.

SHELL-ESSO. Mossmoran, Scotland. 1.3 million mt/y expansion. Contr: Costain Engineering Ltd. Completion: June 1992.

U.S.S.R.

MACHINOIMPORT. Tengulz II & III. Natural gas and oil treatment plant including 2 clause plants under construction. Inlet separation, acid gas removal, and produced water treatment. Contr: Lurgi/Partec Lavalin/Litwin. Completion: 1992/1993.

SOVIET MINISTRY OF OIL REFINING AND PETROCHEMICAL INDUSTRY. Surgut and Tobolsk. Gas processing plants. \$10 billion. Feasibility study: Combustion Engineering, McDermott International, Mitsubishi, Mitsui. Completion: Late 1990's.

VENEZUELA

CORPOVEN SA. North Monagas Oil Field. 5 MMscfd acid tail gas processing plant in the engineering stage. Engr: Parsons. Completion: 1991.

Anzoategui. 400 MMscfd expansion for gas processing capacity.

LAGOVEN SA. Ule. 300 MMscfd cryogenic gas processing plant in the engineering stage. Engr: Fish. Completion: 1991.

Related Fuels—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

AIR PRODUCT & CHEMICALS, Cincinnati, Ohio. 2.3 MMscfd hydrogen plant in the engineering stage. Contr: Howe-Baker. Completion: 1992.

AMCOAL (MW Kellogg and Bechtel development). Quema-honing Indus. Park, Johnstown, Somerset County, Pa. Coal gasification plant processing 485 t/d high sulfur coal. When completed the plant will generate 60 mwg electricity. Completion: 1991.

ASHLAND PETROLEUM Co., Catlettburg, Ky. 10 MMscfd hydrogen plant in the engineering stage. Contr: Howe-Baker. Completion: 1993.

CHAMBERS COGENERATION LP, Carney's Point, N.J. two 140,000 kw pulverized coal fired steam generators. Contr: Foster Wheeler. Completion: Summer 1993.

CHEVRON USA Inc., Richmond, Calif. 99 mw waste gas fueled cogeneration plant. Engr: Bechtel. Completion: Dec. 1992.

DEPARTMENT OF ENERGY, Pittsburgh, Pa. Coal liquefaction complex in the engineering stage. Engr/Contr: Kellogg. Completion: 1993.

DESTEC ENERGY Inc., Green Bay, Wisc. 260,000 kw gas fired cogeneration plant. \$200 MM. Completion: 1995.

ENCOAL, Gillette, Wyo. 1,000 t/d coal gasification plant under construction. Contr: Kellogg. Lic: SGI Inter. Completion: 1992.

ERGON REFINING, Inc., Vicksburg, Miss. 5.5 MMscfd hydrogen plant in the engineering stage. Contr: Howe-Baker. Completion: 1992.

EXXON Co. U.S.A., Benicia, Calif. 49,000 kw cogeneration plant.

INDIANA FARM BUREAU, Mt. Vernon, Ind. 9,000 b/d diesel desulfurizer expansion in the engineering stage. Contr: Howe-Baker Engr. Inc. Completion: 1993.

OHIO ONTARIO CLEAN FUELS Inc., Warren, Ohio. 12,280 b/d coal to liquid fuel (using catalytic process to liquefy crushed and ground coal). Design: HRI. Engr: Stone & Webster. \$225 MM. Completion: 1995.

OLD DOMINION ELECTRIC COOPERATIVE, Richmond, Va. 393,000 kw pulverized coal fired power plant. Contr: Westinghouse/Combustion Engineering/H.B. Zachry/Black & Veatch. Completion: 1993.

SALT CITY ENERGY VENTURE, Solvay, N.Y. Conversion of a direct coal fired power plant. 80,000 kw of electricity and 40,000 lb/hr of process steam. Engr: Duke/Fluor Corp. \$78 MM.

SOUTH CAROLINA ELECTRIC & GAS Co., Orangeburg, S.C. 385 mw coal fired power plant under construction. Contr: Fluor Daniel. Completion: 1996.

TENNESSEE EASTMAN, Kingsport, Tenn. Coal gasification expansion under construction. Contr: Bechtel. Completion: 1991.

10 MMscfd acid gas removal & cryogenic separation expansion in the engineering stage. Process Design: Linde. Completion: 1991.

TEXACO R&M, Anacortes, Wash. (partnership with Mission Energy) 80 mw Cogeneration plant. Completion: Nov. 1991.

CANADA

BP CANADA & PETRO-CANADA, Wolf Lake, Alta. 15,000 b/d bitumen expansion from tar sands. Completion: 1991.

DU PONT CANADA Inc., Brockville, Ont. gas fired cogeneration plant. \$37 MM.

ESSO RESOURCES CANADA Ltd. (OSLO project). Fort McMurray, Alta. (Consortium members: Esso (25%); Canadian Occidental Petroleum Ltd. (20%); Gulf Canada Resources Ltd. (20%); Petro-Canada (15%); PanCanadian Petroleum Ltd. (10%); and Alberta Oil Sands

Equity (10%)). 77,000 b/d from oil sands. Basic engineering and site preparation studies proceeding. \$3.5 billion. Completion: 1996.

HUSKY OIL OPERATIONS Ltd., Lloydminster, Sask. 46,000 b/d heavy oil upgrader under construction. \$1.2 billion. Hydrocracker (HRI); delayed coker and hydrogen plant (FW/SNC); primary upgrader plant (PCL/Braun/Simons); sulfur recovery (Monenco); crude plant and secondary upgrader (Bantrel). Completion: 1992.

SUNCOR, Fort McMurray. 75,000 b/d expansion (125,000 b/d total cap.) from oil sands. \$2 billion. Seeking investors.

18,000 b/d crude expansion from oil sands (71,000 b/d total capacity). \$50 MM. Completion: 1991.

CHINA

BEIJING COKING & CHEMICAL WORKS, Beijing. 66 MMscfd coal gasification plant under construction.

JINCHANG GAS CO., Jinchang, Ganshu. 4.6 MMscfd coal gasification plant under construction.

QINHUANGDAO COAL, Qhd. 10.6 MMscfd coal gasification plant under construction.

SHOUDU IRON & STEEL Co., Beijing. 1.1 mt/d coal gasification plant under construction.

SHOUGANG, Beijing. 1,000 mt/d coal gasification plant in engineering stage. Contr: CTIP. Completion: 1991.

YANRI CWM Co., Shandong. 250,000 mt/y coal water mixture in the engineering stage. Contr: JGC Corp. Completion: 1992.

INDONESIA

AIR PRODUCTS & CHEMICAL W. Java. 36 MMscfd hydrogen plant in the engineering stage. Contr: Howe-Baker Engr. Inc. Completion: 1992.

ITALY

ENICHEM/ANIC SpA, Porto Torres. 500,000 mt/y high concentration coal slurry reocarb unit under construction. Engr/Contr: Snamprogetti. Completion: 1992.

MALAYSIA

AIR PRODUCTS & CHEMICALS, Kuantan. 2.57MM scfd hydrogen plant in the engineering stage. Contr: Howe-Baker. Completion: 1992.

NETHERLANDS

DEMCOLEC, Buggenum. 250 mwg power-from-coal-gas demo project in the engineering stage. Design: Comprimo. Engr: Lummus Crest. Completion: 1993.

SPAIN

REPSOL PETROLEO SA, Puertollano & Tarragona. three 38,000 kw cogeneration units. Completion: 1992.

Cartagena. two 38,000 kw cogeneration units. Completion: 1993.

Somorrosto. two 38,000 kw cogeneration units. Completion: 1992.

UNITED KINGDOM

BRITISH GAS plc, Westfield, Scotland. New coal briquetting plant under construction. Contr: Babcock.

VENEZUELA

QUIMICA OXAL, CA. Caracas. 6.7 MMscfd syngas and 2.3 MMscfd hydrogen plant in the engineering stage. Contr: Howe-Baker. Completion: 1992.

TECNOCONSULT SA, Car-don. \$130 million replacement cogeneration power plant operated by Maraven SA. Engr: Raytheon.

Pipelining—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

U.S. CRUDE LINES

AMOCO PIPELINE Co. 19 miles, 8 in. trunk line replacement in Okla.

8 miles, 8 in. trunk line replacement in N.D.

5 miles, 4 in. and 5 miles, 8 in. gathering line replacement in Tex.

3 miles, 8 in., 10 miles, 12 in. and 1.5 miles, 26 in. trunk line replacements in Tex.

CAJON PIPELINE Co. 122 miles, 20 in. line from offshore Calif. and San Joaquin valley oil fields to the Los Angeles basin. Completion: Early 1993.

CELREON Corp. 11 miles, 24

in. line from Gaviota, Calif. to LasFlores, Calif. under construction.

CHEVRON PIPELINE Co. "17 miles, 10 in. line from Wink to Monohans, Tex. (line replace-

PIPELINING

ment). Completion: Nov. 1991.

DIAMOND SHAMROCK REFINING & MARKETING Co. 270 miles, 14 in. line from Wichita Falls, Tex. to McKee refinery in the Texas panhandle. Completion: Mid-1992.

PACIFIC PIPELINE Co. 171 mile line from giant fields off Calif. to the Los Angeles area.

PERMIAN OPERATING Ltd. PARTNERSHIP. 13 miles, 6 in. from Dolphin field, Divide county, N.D., southeast to an Amoco pipeline in Burke county, N.D.

SUN REFINING & MARKETING. 8.4 miles, 2-3 in. line from various lease connections - Okla. gathering system. Contr: Mid-Continent Pipe Line Co.

TRANSMOUNTAIN OIL PIPE LINE. 144 miles, 36 in. crude line from Low Point, Wash. to Anacortes and Ferndale/Cherry point, Wash. proposed. Completion: 4th Qtr. 1993.

105 miles, 24 in. crude line from Burlington, Wash. to Low Point, Wash. proposed. Completion: 4th Qtr. 1993.

U.S. PRODUCT LINES

AMOCO PIPELINE Co. 2 miles, 18 in. trunk line replacement in Tex.

20.6 miles, 12 in. trunk line replacement in Miss.

CENEX. 246 miles, 8 in. line from Minot, N.D. to Fargo, N.D. to connect with the Williams pipe line system. Completion: Spring 1992.

CHEVRON PIPELINE Co. 10 miles, 8 in. line in the Houston ship channel. Completion: Nov. 1991.

COASTAL Corp. 40 miles, 8 in. line near Markham, Tex.

COLONIAL PIPELINE Co. 45 miles, 12 in. line from Bainbridge, Ga. to Jefferson county, Fl. planned. Completion: 1992.

EXPLORER PIPELINE. 28 in. mainline expansion from Gulf Coast to Dallas-Fort Worth area under study.

U.S. GAS LINES

ALTAMONT GAS TRANSMISSION Co. 620 miles, 36 in. line from Port of Wild Horse, Mont. to Opal, Wyo.

AMERICAN PIPELINE. 38 miles, 16 in. in East Texas to connect Union Pacific Resources Carthage gas processing plant with pipelines to the West.

ANN PIPELINE. 18.2 miles, 8 in. lateral in northern Wis. Completion: 1991.

25 miles, 30 in. looping in northern Wis. Completion: 1991.

14 miles, 30 in. looping in eastern Wis. Completion: 1991.

9.5 miles, 42 in. looping in northern Ind. Completion: 1991.

147 miles line in La. connecting its system to the Tennessee Gas Pipeline Co. line.

CHAMPLAIN PIPELINE Co. 253 mile line from Highgate, Vt. to Medway, Mass. \$354 MM. Planned.

CHEVRON PIPELINE Co. 9 miles, 8 in. line from Fina to Warren LPG gathering system proposed. Completion: July 1992.

CMS GAS TRANSMISSION Co. 25 miles, \$6.5 million gas pipeline in Otsego, Crawford, and Kalkaska counties, Mich. Filed with Michigan Public Service Comm.

CNG TRANSMISSION Corp. 7 miles, 24 in. line from Prince William county, W.V. to Fauquier county, Va. Contr: Otis Eastern. 1991.

51 miles, 24 in. line from Beaver county, Pa. to Armstrong county, Pa. Completion: Fall 1992.

13 miles, 24 in. line from Oneida county, Pa. to Herkimer county, Pa. Completion: Fall 1992.

6 miles, 30 in. line from Chemung county, N.Y. to Tompkins county, N.Y. Completion: Fall 1992.

21 miles, 24 in. line from Prince William county, Va. to Loudoun county, Va. Completion: 1992.

2.35 miles, 30 in. line from Rensselaer county, N.Y. to Albany county, N.Y. Completion: Nov. 1993.

COASTAL Corp. (joint venture with Arkla Inc.) 1,000 miles, 30 in. Wyoming-California Pipeline Co. gas system planned.

COLORADO INTERSTATE GAS Co. 223 miles, 20 in. line from eastern Utah through north-west Colo. to its main system in southwest Wyo. Proposed.

COLUMBIA GAS TRANSMISSION Corp. 5.1 miles of 24 in. in Lancaster county, Pa. before FERC. Completion: Nov. 1991.

7.2 miles, 24 in. in Fayette and Greene counties, Pa. FERC approved. Completion: Nov. 1991.

7.3 miles, 24 in. in Lancaster county, Pa. Completion: Nov. 1991.

14.2 miles, 24 in. in Albemarle, Louisa, Goochland & Chesterfield counties, Va. Before FERC. Completion: Nov. 1991.

5.8 miles, 36 in. in Hardy county, W.V. Before FERC. Completion: Dec. 1992.

1.4 miles, 36 in. Piedmont project from Clay county, W.V. to Randolph county, W.V. Before FERC. Completion: July 1992.

CONOCO Inc. 21 miles, 10 in. Grand Isle project.

EASTERN AMERICAN

STATES TRANSMISSION. (Coastal Corp.). 285 miles, 30 in. from Ohio to Pa. and 76 miles, 24 in. from New York City to Long Island. Before FERC.

EL PASO NATURAL GAS. 14.2 miles, 42 in. line in San Juan county, N.M. before FERC. \$26.2 MM. Completion: Winter 1991.

12.8 MM line in San Juan county, N.M. before FERC. Completion: Winter 1991.

39.2 miles, 42 in. line in McKinley county, N.M. before FERC. \$39.5 MM. Completion: Winter 1991.

15.5 miles, 36 in. line in McKinley county, N.M. before FERC. \$13 MM. Completion: Winter 1991.

16.2 miles, 36 in. line in Apache county, Ariz. before FERC. \$20.3 MM. Completion: Winter 1991.

18.1 miles, 30 in. line in Navajo county, Ariz. before FERC. \$21.1 MM. Completion: Winter 1991.

44.8 miles, 34 in. line in Yavapai county, Ariz. before FERC. \$31.5 MM. Completion: Spring 1992.

62.4 miles, 36 in. line in Mohave county, Ariz. before FERC. \$45.3 MM. Completion: Spring 1992.

ENDEVECO Inc. 240 miles, 20-24 in. from Shreveport, La. to south central Miss. \$95 MM. Completion: Winter 1991-92.

44 miles, 24 in. line from Delhi, La. to Vicksburg, Miss. planned.

19 miles, 8-12 in. line in Smith and Simpson counties, Miss.

ENRON Corp. Filed with FERC for an expansion of its eastern leg from Ogden, Iowa to near Janesville, Wisc. Completion: 1992.

30 in. line across the Mississippi river.

FLORIDA GAS TRANSMISSION. 36 miles, 18 in. line from Hillsborough county, Fl. to Manatee county, Fl. Completion: May 1992.

GATEWAY PIPELINE Co. (United Gas Pipe Line). 25 miles, 30 in. line to connect existing and planned gas treatment plants in Mobile County, Ala. to United's Lorette, La. to Mobile, Ala. line. Completion: Dec. 1991.

GREAT LAKES GAS TRANSMISSION Co. 25.4 miles, 36 in. Houghton Lake, Mich. Completion: Dec. 1991.

INTERCON GAS Inc. 77 miles, 6 in. line from near Festus, Mo. to Rolla, Mo. Completion: Late 1991.

JUBILEE PIPELINE SYSTEM. 100 miles, 8-24 in. Various offshore blocks in Mobil area Bayou

La Batre planned. Completion: 1991.

KERN RIVER GAS TRANSMISSION Co. (Williams Cos. and Tunneco). 904 miles, 36 in. from Opal, Wyo. to Bakersfield, Calif. \$800 MM. FERC final certificate issued. Completion: Dec. 1992.

67 miles, 36 in. line from Opal, Wyo. to Chalk Creek rd., Utah. Contr: Hood. Completion: Nov. 1991.

13 miles, 20 in. line connecting Southwest Wyo. to Kern's system.

KN ENERGY Inc. 21 miles gas line from Aledo, Okla. to Thomas, Okla.

MAGNOLIA PIPELINE Co. (Basin Pipeline Corp. and a unit of Transco Energy Co.) 55 miles intrastate line, 40 miles of laterals from Alabama's Black Warrior basin to Transco's interstate line in Central Ala. \$55 Million.

MISSOURI PIPELINE Co. 22 miles of 12-16 in. line from Curryville, Mo. to St. Charles and West Alton, Mo. \$15 MM.

Converting 70 miles of existing crude line to gas line in Pike, Lincoln, and St. Charles counties, Mo.

MOHAVE PIPELINE OPERATING Co. 379 miles line from Topock, Ariz. to Bakersfield, Calif. Contr: Fluor Daniel. Completion: 1st Qtr. 1992.

NORTHERN BORDER PIPELINE. 368 miles, 30 in. mainline extension from Ventura, Iowa to Tuscola, Ill. Postponed. \$374 MM.

NORTHERN NATURAL GAS. 25 miles, 16 in. branch line in Madison, Wisc. Contr: Sovde Bros. Completion: 1991.

NORTHWEST PIPELINE Corp. 612 miles of pipeline loops in Ore., Wash., Idaho, Wyo., Colo. and N.M. Completion: Jan. 1993.

OKTEX PIPELINE Co. 84 miles, 20 in. line. A drilled Red River crossing north of Byers, Tex. Completion: Nov. 1991.

PACIFIC GAS TRANSMISSION. 430 miles, 42 in. from Kingsgate, B.C., to Malin, Ore. \$1 billion. Before FERC. Project manager: Bechtel. Completion: Nov. 1993.

294 miles, 42 in. and 120 miles, 36 in. from Malin, Ore. to Kern River Station, Calif. Before CPUC. Project manager: Bechtel. Completion: Nov. 1993.

900 miles, 36-42 in. gas line from the British Columbia-Idaho border to San Francisco Bay area in the detailed design phase. Contr: Bechtel. Completion: 1993.

120 miles, 36 in. gas line from the San Francisco Bay area to Fresno county. Completion: 1993.

PIPELINING

PHILLIPS PIPELINE Co. 324 miles, 10 in. line from Benedum to Brookshire, Tex. Design: Gulf Interstate. Completion: Dec. 1991.

QUESTAR PIPELINE Co. 46 miles, 20 in. line in southern Wyo. and eastern Utah.

SEAGULL ENERGY Corp. 73 miles, four pipelines from Deer Park, Tex. to Mont Belvieu, Tex.

SHELL PIPE LINE Co. 7.3 miles, 12½ in. line in the Gulf of Mexico from Bullwinkle platform to Boxer platform.

SOUTHERN CALIFORNIA GAS CO. 6.1 miles, 30 in. line from Glendale, Calif. to Los Angeles, Calif. Contr: ARB, Inc. Completion: Dec. 1991.

*2.1 miles, 26 in. line from South gate, Calif. to Cudahy, Calif. planned. Completion: Feb. 1992.

SOUTHERN NATURAL GAS Co. 60 miles, 20 in. line in Mississippi canyon block 397 under construction. Contr: OPI International. Completion: Feb. 1992.

TENNECO Inc. AND CITRUS Corp. (joint venture) 53 miles, 36 in. line from Mobile Bay off Ala. north to an interconnection with Florida Gas Transmission Co. Before FERC.

TENNESSEE GAS PIPELINE Co. 31.4 miles, 30 in. near Buffalo, N.Y. Completion: Dec. 1991.

*223 miles, 30 in. crossover line near Jonesboro, La. to near Heidelberg, Miss. Completion: Early 1993.

TEXACO EXPLORATION & PRODUCTION Inc. 22.8 miles, 2-12 in. line from Enron CO₂ pipeline source to 90 injection wells under construction. Contr: B&H. Completion: Dec. 1991.

TEXAS EASTERN TRANSMISSION (joint venture with ANR Pipeline) 204 miles, 30 in. line from existing and proposed gas processing plants in Mobile county, Ala., northwest to Texas Eastern's main line in Kosciusko, Miss. \$153.3 MM. Before FERC.

(Texas Eastern only) 55 miles, 24 in. offshore line from Mobile county, Ala. and future offshore production facilities in the Norphlet trend southwest to a proposed Viosca Knoll extension of the company's Main Pass pipeline system. \$72.5 MM.

TEXAS GAS TRANSMISSION Corp. 62.4 miles, 36 in. line from Breckinridge county, Ky. to Warren county, Ohio. Completion: Nov. 1991.

69 miles, 30 in. from Bolivar county, Miss. to Lincoln county, Ark. Completion: Nov. 1991.

26.4 miles, 36 in. line from Ohio county, Ky. to Dearborn county, Ind. Completion: Nov. 1991.

21.1 miles, 24 in. line in Clairborne parish, La. Contr: Sunland. Completion: Nov. 1991.

*1.4 miles, 20 in. line from Breckinridge, Ky. to Perry county, Ind. Contr: Harco. Completion: Nov. 1991.

TRANSCO ENERGY Co. *9.1 miles, 12 in. line in Allentown lateral, Pa. Completion: Sept. 1992.

*4.4 miles, 26 in. line in Trenton woodbury replacement, N.J. Completion: Oct. 1992.

*4.1 miles, 42 in. line in Mainline loop, N.J. Completion: Oct. 1992.

*6.7 miles, 36 in. line in Leidy loop, Pa. Completion: Oct. 1992.

TRANSCONTINENTAL GAS PIPELINE Co. 23.94 miles, 36 in. loops in Monroe and Luzerne counties, Pa. Contr: Murphy Bros.

48 miles, 12-30 in. from Edison to Riverdale, N.J. Contr: Napp-Grecco Corp.

5 miles, 36 in. in Morris and Essex counties, N.J. Contr: Otis Eastern Services Inc.

9.4 miles, 10 in. line on High Island.

12.2 miles, 16 in. line on Mustang Island.

*47 miles, 30 in. line from pipelines in N.J. across New York Bay to Long Island and into the New York City area terminating near JFK Airport. \$115 MM.

TRANSTEX GATHERING SYSTEM 40 miles, 12 in. from High island blocks A69 to block A109.

TRANSWESTERN PIPELINE Co. 98 miles, 30 in. San Juan pipeline from Farmington to Gallup, N.M. Completion: Dec. 1991.

200 miles, 30 in. transwestern loops - 5 sections of approx. 40 miles each. Completion: Dec. 1991.

VALERO NATURAL GAS PARTNERS LP. 3½ miles, 24 in. line from its existing line near Penitas, Tex. to Petroleos Mexicanos' 42 in. line outside Reynosa, Tamaulipas, Mexico.

VIRGINIA NATURAL GAS. 80 miles, 24 in. and 40 miles, 10 in. from Richmond, Va. to James City county, Va. Completion: 1991.

ALGERIA

SONATRACH. *90 miles, 8-14 in. gas line from Rhourde Chouff and Rhourde Hamra gas field development in progress. Contr: Snamprogetti. Completion: 1994.

SONELGAZ. *400 miles, 42 in. gas line from Hassi R'Mel to Skikda in the engineering stage. Contr: Spie-Capag. Completion: 1993.

300 mile gas line from Hassi R'Mel gas field in Algeria to the

Moroccan border. Proposed. Completion: 1995.

AUSTRALIA

GAS & FUEL CORP OF VICTORIA. 62 miles, 6 in. gas line from Allansford to Portland planned. Completion: June, 1993.

MAGELLAN PETROLEUM Corp. 375 mile gas line from the Amadeus-Darwin pipeline to the Nabalco bauxite mine and alumina refinery at Gove. Contr: Nabalco pty. Ltd.

BANGLADESH

BANGLADESH OIL, GAS AND MINERALS Corp. 117 miles, 20 in. gas line from Kailashitla to Ashanganj. Design stage. Consulting: Pencol. Completion: 1991.

BELGIUM

DISTRIGAZ. 91 miles, 40 in. gas line from Zeebrugge (Dudzele) to Biaregnies (Quevy). Completion: Dec. 1992.

60 miles, 20 in. gas line from Berneau to Bastogne planned. Completion: Dec. 1993.

*4 miles, 10 in. gas line from Sint-gillis-waas to Sint-niklaas planned. Completion: Dec. 1993.

*6 miles, 12-24 in. gas line from Anderlecht, Bruxelles to Drogenbos, Bruxelles planned. Completion: Dec. 1992.

*2 miles, 16 in. gas line in Seraing. Valfil planned. Completion: Dec. 1992.

*4 miles, 10 in. gas line in Gent planned. Completion: Dec. 1993.

CANADA

FOOTHILLS PIPELINES (YUKON) Ltd. 1,429 miles of gas line from the Arctic Coast near Inuvik, North West Territory to Caroline in Central Alberta to connect with existing North American pipeline systems. \$4.4 billion. Before NEB. Completion: 1996.

IROQUOIS GAS TRANSMISSION SYSTEM. 26.3 miles, 24 in. line across Long Island Sound.

NOVA Corp. of ALBERTA. *14 miles, 42 in. and 72 miles, 20 in. and 84 miles, 16 in. and 60 miles, 4-12 in. gas lines in various locations in Alta. planned. Completion: April 1992.

PACIFIC COAST ENERGY Corp. (joint venture of Westcoast Energy and Chieftain Development) 118 miles, 10½ in. Mainland portion of the Vancouver Island pipeline project. Contr: Majestic Contr. Ltd.

PETROLEUM RESOURCES Ltd. 21 miles, sour gas pipeline near Calgary. \$14 million. Approval received.

POLAR GAS Ltd. 1,450 miles, 36 in. from Canadian Mackenzie Delta Pipeline Project to Caroline, Alberta planned. Contr: Transcanada Pipelines Ltd./Tenneco Inc./Panarctic Oils Ltd. Completion: Nov. 1996.

POUCE COUPE PIPE LINE Ltd. 16 miles of crude line connecting facilities built by Norcen Energy and Canadian Hunter in Northeast B.C. with Peace Pipe system in northwest Alta.

SHELL CANADA. 42 km liquid sulfur line in Caroline, Alta. under construction. Engr: Shawinigan. Contr: Petrotech Lavalin. Completion: Dec. 1991.

TRANSCANADA PIPELINES Ltd. *98 miles, 48 in. gas line from Empress to Sask./Man. border. (Sask. loop) under construction. Contr: Majestic pipeliners. Completion: Dec. 1991.

*62 miles, 48 in. and 7 miles, 42 in. from Sask./Man. border to Man./Ont. border (Manitoba loop) under construction. Contr: Spie. Completion: Dec. 1991.

*96 miles, 42 in. gas line Northern Ont. loop under construction. Contr: O.J. pipeliner. Completion: Dec. 1991.

UNION GAS. 65.1 km, 48 in. gas line in south western Ontario. Completion: 1991.

8.5 km, 12 in. gas line in south western Ontario. Completion: 1991.

CHINA

CHINA NATIONAL OIL Corp. 180 mile, 426 mm crude line from Zhongyuan oil field to Luoyang, Henan, refinery.

CHINA, TAIWAN

CHINESE PETROLEUM Corp. 40 miles, 12-20 in. crude and product line planned in northern oil terminal.

190 miles, 8-24 in. gas loop lines planned from Yungan to Tunghsiao.

COLOMBIA

ECOPETROL.

300 miles, 24 in. crude line from Vasconia to Covenas (Oleoducto Colombia). Contr: Spie-Capag. Completion: March 1992.

17 miles, 8 in. product line from Guacari to Yumbo.

PROMIGAS S.A. 373 miles, 20 in. and 2,459 miles, 24 in. gas line from Pajaro to Bogota under study.

7 miles, 4 in. gas line from main gas pipeline to Montelibano planned.

9.3 miles, 3 in. gas line from main gas pipeline to Corozal planned.

PIPELINING

12.4 miles, 4 in. gas line from main gas pipeline to Arjona planned.

8.7 miles, 4 in. gas line from Barranquilla to Puerto Colombia planned.

5.4 miles, 3 in. gas line from main gas pipeline to Galapa planned.

DENMARK

DANSK OLIE OG NATUR-GAS. 5 miles, 12 in. gas line from Ka'vebod to HCV power plant. Under design. Completion: 1993

28 miles, 24 in. gas line from Stepilille (gas storage) to Torslund under design. Completion: 1992

15 miles, 12 in. gas line from Milov to Svinnemøllen under study. Completion: 1993

ECUADOR

PETROLEOS DEL ECUADOR. 165 km., 6-8 in. gas line from La Libertad refinery to Mantua. Contr: Techint

EGYPT

AGIP SpA. 90 miles 6-8-22 product line at the El Qar'a (Abu Madi) integrated NGL plant in progress. Contr: Snamprogetti. Completion: 1991

FINLAND

NESTE OY. 26 mile extension of Nesty Oy's southern Finland gas line into greater Helsinki. Contr: E. M. Pekkinen Oy. Welding and fitting. Zarubezhneftegasstroj (U.S.S.R.) \$10 MM

FRANCE

GAZ DE FRANCE. (joint venture with Gas du Sudouest and Enagas) 44 miles, 24 in. gas line from Serrablo, Spain to Lacq. France Completion: 1991

GAZ DU SUD-OUEST. 44 miles, 26 in. gas line from Lacq to Port de Larrau in the engineering stage. Completion: 1993

GERMANY

EVG. 186 miles, 24-40 in. gas line from Vitzroda to Zwickau. Contr: Arge PKM/PLE. Completion: 1991-1992

MIDAL GmbH. (joint venture of Wintershall AG) 348 miles, 32 in. gas line from Rysum (near Emden) to Ludwigshafen. Completion: 1993

GASVERSORGUNG SUD-DEUTSCHLAND GmbH. 19 miles, 16 in. gas line from Pfulendorf to Nenzingen planned. Completion: Oct. 1993

RHEIN-MAIN-ROHRLEITUNG. 1 mile, 20 in. product line from Essen-Dellwig to Bottrop planned. Completion: 1992

RUHRGAS AG. 153 miles, 48 in. gas line from Werne to Schluchtern planned. Contr: Pipeline Engineering GmbH. Completion: 1994

40 miles, 40 in. gas line from Lauterbach to Vitzroda planned. Contr: Pipeline Engineering GmbH. Completion: End 1992

15.5 miles, 24 in. gas line planned from Vinnhorst to Ahlen. Contr: Pipeline Engineering GmbH. Completion: End 1993

7.5 miles, 12 in. gas line planned from Bonn to Euskirchen. Contr: Pipeline Engineering GmbH. Completion: 1992-93

102.5 miles, 48 in. gas line planned from Achim to Salzweide. Completion: End 1993 (joint venture with BEB Erdgas und Erdol GmbH)

STATOIL DEUTSCHLAND GmbH. 44 miles, 42 in. gas line from Emden to Etzel. Contr: Mannesmann. Completion: Oct. 1993

GREECE

DEPA (PUBLIC GAS Corp.) 62 miles, 36 in. and 257 miles, 30 in. gas line from Koula (Greek-Bulgarian border) to Athens. Completion: March 1993

HUNGARY

HUNGARIAN OIL & GAS TRUST. 58 miles, 24 in. gas line from Dorog to Győr. Contr: Olajterv. Kvv. Completion: Dec. 1991

70 miles, 28 in. gas line from Endrod to Kiskundorozsma to Roszke. Completion: Dec. 1991

18 miles, 10 in. gas line from Kormend to Szentgáthard. Completion: Dec. 1991

INDIA

CHEMBUR PATALGANGA PIPELINES Ltd. 66 miles, 8 in. kerosene line from Chembur to Patalganga under construction. Contr: Dodsai Ltd. Completion: Dec. 1991

OIL & NATURAL GAS COMMISSION. 98 miles, 4-20 in. Bombay high offshore gas lift pipeline network. Contr: Snamprogetti. Completion: 1991

OIL INDIA Ltd. (Indian Oil Corp.) 909 mile petroleum products line from Kandla, Gujarat, to Bhatinda, Punjab. \$240 MM. Completion: May 1993

POLYOLEFINS INDUSTRIES Ltd. 48 miles, 6 in. ethylene line from Nagothiane to PIL under construction. Contr: Dodsai Ltd. Completion: Dec. 1991

INDONESIA

650 miles, 10-16 in. products line in the engineering stage in the Trans Java network. Completion: 1993

IRAN

IGAT 2. 880 miles, 48-56 in. from Kangan gas field on the Persian Gulf to the Soviet Union. Contr: Saipem (will lay 20% of remaining pipeline)

NATIONAL IRANIAN OIL Co. 63 miles, 42 in. crude line from Gurreh to Taheri (Moharram project). Contr: Snamprogetti. Completion: 1991

1,139.6 miles, 12 in. product line from Arak to Malayer and Mamadan.

ITALY

SNAM SpA. 168 miles, 36-42 in. gas line from Tarvisio to Zimella in progress. Italian section of the U.S.S.R.-Italy Natural Gas Pipeline Expansion. Contr: Snamprogetti. Completion: 1991

TRANSMEDITERRANEAN PIPELINE Co. Ltd. 99 miles, 24-26-28 in. gas line from Cap Bon, Tunisia to Mazara del Vallo, Italy. Algeria-Italy natural gas submarine pipeline expansion in progress. Contr: Snamprogetti. Completion: 1992

KENYA

KENYA PIPELINES Co. Ltd. 355 miles, 6-8 in. products line from Nairobi to Kisumu/Eldoret, western Kenya (extension of existing Mombasa to Nairobi pipeline) under construction. Contr: NKK Corp./Lavalin. Completion: 1993

KOREA

KOREA PETROLEUM DEVELOPMENT Corp. 541 miles, refined products trunkline system from refineries at Yosu and Onsan to Seoul. Completion: 1992

LIBYA

416 miles, gas line from Al Brika to Khoms.

MALAYSIA

PETRONAS. 485 miles, 36 in. gas line from Kerteh on Malaysia's northeast coast to Singapore with branch lines to Kuala Lumpur and other large Malaysian cities. Total cost: \$310 MM. Completion: Nov. 1991

MEXICO

PEMEX. 37 miles, 24 in. crude line from Venta de Carpio to Tula under construction

24 miles, 24 in. gas line from San Pablo to Cuernavaca under construction

77.7 miles, 16 in. gas line from Palmillas to Toluca under construction

15 miles, 18 in. product line

from Salina Cruz refinery to Maritime terminal under construction.

MOROCCO

900 miles of gas line through Morocco to Tangier to a link across the Strait of Gibraltar to Spain. Proposed. Completion: 1995

SOCIETE CHERIFIENNE DES PETROLES. 115 miles, 14 in. crude line from Port of Mohammedia to Sidi Kaceri Refinery, in the engineering stage. Engr: OTP. Completion: 1992

THE NETHERLANDS

NV NEDERLANDSE GAS-SUNIE. 34.5 miles, 24 in. gas line from Zuidwending to Witteveen. Completion: Jan. 1992

11.5 miles, 42 in. gas line from Ten Boer to Borgercompagnie.

25 miles, 48 in. gas line from Witteveen to Ommen. Completion: Jan. 1992

13.5 miles, 36 in. gas line from Lintvelde to Winterswijk. Completion: Nov. 1991

NAM. 161 miles, from F3 area of the Dutch North Sea to the Dutch Coast (joint venture with Elf Petroland and Energie Beheer Nederland). Contr: McDermott-ETPM. Completion: 1991-92

NIGERIA

NIGERIAN NATIONAL PETROLEUM Corp. 55 km, 16 in. Mogas/Gas oil product pipeline from proposed Bonny crude oil terminal to Port Harcourt refinery. Completion: June 1993

55 km, 16 in. high pour fuel oil pipeline from proposed Bonny crude oil terminal to Port Harcourt refinery. Completion: June 1993

SHELL PETROLEUM DEVELOPMENT. 7 miles, 8 in. crude line from Belema flowstation to Nembe Creek Cawthorne Channel trunkline planned. Completion: Dec. 1992

43 miles, 20-24 in. crude line from Opukushi to Forcados terminal (Trans Ramos Pipeline) planned. Completion: Dec. 1993

6 miles, 8 in. crude line from Okpokonou flowstation to Southern Forcados Pipeline at Ogara Manifold planned. Completion: Dec. 1993

6 miles, 8 in. crude line from Kanbo flowstation to Trans Ramos Pipeline at Kanbo Manifold planned. Completion: Dec. 1993

NORWAY

NATO LANDSVERDEDIGING. 20 miles, 12 in. crude line from Vlaardingen to Zoetermeer. Contr: Denys NV. Completion: Dec. 1991

PIPELINING

STATOIL. 25 miles, 30 in. gas line from Zeepipe Sleipner to Statpipe. Engr: Snamprogetti. Completion: 1993.

500 miles, 40 in. gas line from Zeepipe Sleipner, Norway to Zeebrugge, Belgium. (Zeepipe Natural Gas Transportation System - Phase 1) Engr: Snamprogetti. Completion: late 1993.

116 miles, 36-40 in. gas line from Zeepipe Troll to Heimdal planned. Completion: 1996.

487 miles, 40 in. gas line from Zeepipe Troll to Sleipner planned. Completion: 1997.

150 miles, 20 in. gas pipeline from Sleipner to Karsto planned. Completion: 1993.

*365 miles, 40-42 in. gas line from Block 16/11 (Norwegian sector) to Emden (Europipe) planned. Engr: NPC. Completion: Oct. 1995.

OMAN

PETROLEUM DEVELOPMENT OMAN. 110 mile four pipeline gas system. Contr: Saipem/Consolidated Contr. Co.

PAKISTAN

PARCO. (Pak Arak Refinery Co. Ltd.) 865 miles, 16 in. product line from Lahore to Islamabad in the engineering stage. Completion: 1991.

PAPUA NEW GUINEA

CHEVRON NIUGINI pty Ltd. 170 miles, 20 in. crude line from Iagitu-Hedina field to Kiwori Creek export terminal (Kutubu development project). Contr: Spie Capag (onshore). Completion: July 1992.

SOUTH PACIFIC CHEVRON Co. 40 miles, 6-18 in. gas and crude lines in Iagitu-Hedina. Contr: Bechtel. Completion: 1993.

PERU

PETROLEOS DEL PERU. 364 miles, 26 in.; 300 miles, 10 in.; 64 miles, 8 in. gas lines from Camisea-Cuzco to Callao-Lima. Bidding. Completion: mid 1993.

52 miles, 6 in. gas and product line from Aguaytia to Pucallpa-Campo Verde. Completion: 1993.

52 miles, 4 in. product line from Aguaytia to Pucallpa-Campo Verde. Completion: 1993.

30 miles, 3 in. product line from Aguaytia to Pucallpa-Campo Verde. Completion: 1993.

PORTUGAL

280 mile line from Setubal

south of Lisbon to Braga near the Spanish border. Completion: 1993.

SAUDI ARABIA

SAUDI ARAMCO. 1,200 km, 56 in. crude line from Arabian Gulf to Yanbu (Red Sea) in the engineering stage. Contr: Mannesmann AG. Completion: End 1992.

16 miles, 56 in. crude line on the east-west pipeline (loopline) incl. 11 pump stations. Completion: End 1992.

SPAIN

CAMPSA. 90 miles, 10 in. products line from La Coruna to Vigo under construction. Contr: Tecnicas Reunidas/Heymo. Completion: 1992.

60 miles, 10 in. products line from Cartagena to Alicante under construction. Contr: Tecnicas Reunidas/Heymo. Completion: 1992.

130 miles, 8 in. product line from Almodovar to Merida (eastern Spain) planned. Completion: Late 1992 or early 1993.

EMPRESA NACIONAL DE GAS SA. 145 miles, 26 in. gas line from Sevilla to Brazatortas in engineering stage. Contr: Heymo. Completion: 1991.

44 miles, 24 in. gas line from Serrablo, Spain to Lacq, France. (joint venture with Gas de France and Gas du Sudouest). Contr: Heymo. Completion: 1991.

*262 miles gas line from Valencia to Alicante in the engineering stage. Contr: Tecnicas Reunidas. Completion: Nov. 1992.

REPSOL PETROLEO SA. 350 km., 22 in. crude line from Cartagena to Puertollano in the engineering stage.

SWITZERLAND

GASVERBUND MITTEL-LAND AG. 17 miles, 12 in. natural gas line under construction. Engr: Helbling. Completion: End 1991.

7.5 miles, 12 in. gas line from Ariesheim to Pratteln in the engineering phase. Engr: Helbling and Jaustlin & Stebler Engin. Completion: End 1992.

5 miles, 8 in. gas line from Lenzburg to Villmergen in the engineering phase. Engr: Balzari & Schudel Engin. Completion: End 1992.

*4.7 miles, 6 in. gas line from Busserach to Zwingen planned. Engr: Helbling. Completion: End 1991.

GVO GASVERBUND OSTSCHWEIZ AG. 5.5 miles, 10 in. gas line from Gossau to Bis-

chofszell planned. Completion: End 1991.

SYRIA

AL FURAT PETROLEUM Co. 50 miles, 10-12-14 in. gathering lines in the engineering stage. Engr: Lavalin Int. Completion: Feb. 1992.

THAILAND

PETROLEUM AUTHORITY OF THAILAND. (PTT).

100.6 miles, 24 in. natural gas line from Erawan to Khanom district to Nakhon Si Thammarat province. Completion: 1994.

106.3 miles, 32 in. natural gas line from PTT's B structure gas field to Unocal Thailand Ltd's Erawan field. Completion: 1993.

5.8 miles, 6-10-16 in. natural gas line from National Petrochemical Co. to the factories in Mab Ta Pud estate under construction. Completion: May 1992.

146.3 miles, 20 in. oil product line from Sri Racha, Chonburi province to Saraburi province under study. Completion: 1993.

UNITED KINGDOM

ARCO BRITISH Ltd. 41 miles, 24 in. and 5 miles, 16 in. gas line from Pickerill gas field (U.K. southern north sea) to Theddlethorp (U.K. mainland) in design & construction. Completion: 1992.

BORD GAIS EIREANN. 45 miles, 30-36 in. gas line in Southwest Scotland in the engineering stage. Engr: John Brown. Completion: Sept. 1993.

BP EXPLORATION. 36 in. pipeline to serve Forties field in the U.K. North Sea. Contractor: ETPM Services (U.K.) Ltd.

15 mile, 12 in. natural gas liquids pipeline linking Total Oil Marine plc's St. Fergus, Scotland, gas terminal to BP's Cruden Bay terminal.

BRITISH GAS plc. *22 km., 250 mm line from Inverness to Dingwall. Completion: Oct. 1992.

*15 km., 450 mm line from Eaglesham to Kilmarnock. Completion: Oct. 1992.

CATS-Central Area Transmission System. (40% Gas Council Exploration Ltd., 30% Amoco UK Exploration, 18% Amerada Hess, 12% Texas Eastern North Sea Inc.). 410 km, 36 in. gas line from Everest and Lomond fields to Teesside. \$1.8 billion central U.K. North Seas gathering system. Contr: McDermott/ETPM. Completion: Aug. 1992.

ESSO PETROLEUM Co. 31 miles, 12 in. product line into Birmingham International Airport,

England. Contr: John Brown. Completion: Sept. 1992.

MOBIL NORTH SEA Ltd. 210 miles, 30 in. gas line from Beryl oil field in the U.K. North Sea to St. Fergus, Scotland. Contr: Brown & Root/Saipem.

SHELL CHEMICAL U.K. Ltd. 251 miles, 10 in. ethylene pipeline system linking the Stanlow and Carrington plants in north-western England to Grangemouth under construction. \$154 MM. Contr: Bechtel. Completion: Early 1992.

*58 miles, 10 in. products line from Penrith to Cockerham under construction. Contr: Spie-Capag. Completion: Dec. 1991.

*58 miles, 10 in. ethylene line from Grangemouth to Stanlow underway. Contr: Land & Marine. Completion: 1992.

U.S.S.R.

MACHINOIMPORT. Tengiz. 188 miles, various size pipelines. Field gathering system to transport sour oil and gas from 100 wellhead sites to 4 locally situated refinery plants under construction. Contr: Lavalin Int. Completion: 1991.

VENEZUELA

PETROLEOS DE VENEZUELA. *11 miles, 10 in. naphtha products line from Lagoven-Amay to Maraven-Cardon under construction. Contr: Rivaco/Impaviance. Completion: 1991.

*11 miles, 10 in. vacuum gas oil products line from Lagoven-Amay to Maraven-Cardon under construction. Contr: Rivaco/Impaviance. Completion: 1991.

YUGOSLAVIA

MAKPETROL. 100 km gas line from Kriva Palanka, U.S.S.R. near the Bulgarian border to the Macedonian republic capital of Skopje, Yugoslavia. Completion: March 1994.

ZAMBIA

TAZAMA PIPELINES LTD. 1,068 miles, 8 in. and 480 miles, 12 in. of crude pipeline from Dar-Es-Salaam, Tanzania to Ndola, Zambia. Completion: 1993.

ZIMBABWE

LONRHO PLC. 135 miles, 10 in. products line from Feruka to Harare (extension of Beira to Feruka pipeline). Study and conceptual design stage. Consulting: Pencol. Completion: 1991.

COMPANAI DO PIPELINE MOCAMBIQUE. 180 miles, 10 in. products line rehabilitation from Beira, Mozambique to Feruka, Zimbabwe. Contr: John Brown.

\$ PIPELINE ECONOMICS

1990 U.S. interstate pipelines' efficiency continues improving

In this report...

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Warren R. True

Pipeline/Gas Processing Editor

The U.S. gas-transmission industry may look back on 1989-90 as the period it turned the corner in adjusting to the new realities of a less regulated environment.

For 1990, sharply higher volumes of gas transported for others and higher net incomes offset flat revenues and declining gas sales for major and nonmajor U.S. interstate natural-gas pipeline companies.

These improvements followed similar increases in 1989 after industry revenues and incomes appeared in free-fall for 1985-87 (Table 1 and Fig. 1).

And even regulated, U.S. common-carrier oil pipelines saw more success in 1990, as operating revenues and incomes improved (Table 1) despite fewer miles operated, less crude oil and product delivered, and lower overall trunkline traffic.

These data along with others from annual reports filed with the U.S. Federal Energy

Regulatory Commission (FERC) are tracked in this annual Oil & Gas Journal Pipeline Economics Report. (See company tables pp. 57-63).

Additionally, this year's annual Journal report for the first time contains cost information for completed pipeline projects with comparisons to their estimates at the time of proposal.

Historic change

The shift of interstate natural-gas pipelines from their historic role as merchants of gas to transporters continued in 1990.

Volumes of gas moved for others by these companies last year increased by more than 16% for major companies and by almost 10% over-

all. This follows an increase in 1989 of more than 9% for majors and more than 15% for all companies.

Gas sold by these same companies, however, declined again last year; by almost 17% for majors and by almost 20% overall. In 1989, the decline was 13% for majors and 5% for all companies reporting.

For common-carrier oil pipelines, moving both crude oil and product, operations continued to be sluggish but revenues improved by almost 10% and incomes by more than 5% for data tracked in by Journal Pipeline Economics Reports.

On the construction front, U.S. projects proposed to the FERC for the 12-month period ending June 30 (Table 2)

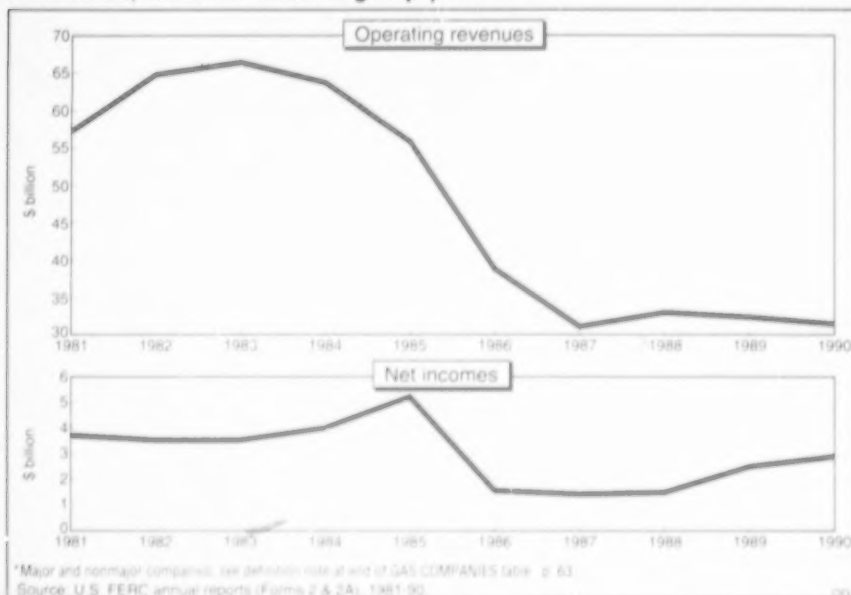
amounted to more than 3,000 miles.

This is a notable amount of proposed mileage and indicates confidence by those companies in the growth of natural-gas use, especially as a relatively clean-burning fuel in light of the public's growing environmental concerns.

The depressed levels of gas pricing during 1991 does not seem to have dampened pipeline companies' interests in gaining access to new markets or new sources of supplies.

Cost figures for these projects are taken from estimates accompanying companies' applications to the FERC for approval to build the systems. This year, Oil & Gas Journal introduces cov-

Revenues, income: natural-gas pipelines*



erage of the actual costs for some of these projects proposed, in some cases, much earlier than the dates of their completion (Table 3).

Incomes and mileage

Net incomes for regulated major interstate natural-gas pipeline companies improved significantly last year, up by more than 6% (\$135 million). Incomes for combined major and nonmajor gas pipelines were up by more than \$383 million (15.4%).

Operating revenues, on the other hand, were generally flat when compared to 1989: for majors, these showed an increase of only \$148 million

(0.57%). Overall, operating revenues for majors and nonmajors fell by \$148 million (-0.46%).

Operating revenues for major and nonmajor natural-gas transmission companies were falling beginning with 1983 until a slight uptick for 1988 (Fig. 1). Similarly, net incomes fell in 1983 and for 2 years beginning with 1986 and 1987. The increase in 1989 was the largest of the decade, eclipsing a big jump in 1985.

Petroleum-liquids pipeline companies' net incomes in 1990 increased by 5% (almost \$113 million) on operating revenues that increased

9.8% (\$636.5 million). That increase in revenues reverses a 5-year trend begun in 1985. The hike in income resumes the generally upward movement for the decade 1981-91 (Fig. 1 and Table 1).

Pipeline mileage reported by major natural-gas companies was essentially flat for 1990 compared with 1989, rising 2.75% (more than 6,600 miles). Majors operated more than 7,500 new miles of transmission line last year, an increase of 4.15%. Year to year, field-line use fell slightly, storage line use was flat.

For major and nonmajor pipeline companies, there

was little change in the U.S. interstate gas-pipeline system for 1990 compared with 1989. Transmission lines increased slightly more than 1%; line for field and storage decreased fractionally.

Liquid pipeline companies showed virtually no change (-0.16%) in total pipeline mileage utilized during 1990 compared with 1989. Mileage for gathering and crude oil fell; product pipeline mileage increased slightly last year.

Total mileage reported for 1990 was 442,974 with 168,364 miles for crude oil and product pipelines and 274,610 miles for gas transmission, field, and storage (Table 4).

Construction pace

For the 12-month period ending June 30, more than 3,000 miles of pipeline construction were proposed to the FERC, of which 36 miles were planned for offshore Gulf of Mexico (Table 2).

This total mileage was proposed in 129 construction projects, 3 of which were for offshore.

For the 12-month period July 1, 1989, to June 30, 1990, 7,291.03 miles of pipeline were proposed of which 60.08 miles were planned for offshore.

A large portion of the land construction filed for approval with the FERC during the 1989-90 period consisted of projects being refilled as a result of changes in volumes, diameters, lengths, or compression.

These refilings comprised approximately 2,100 miles of the mileage proposed for the 1989-90 period.

Excepting these 2,100 miles of refilings, the remaining mileage of approximately 5,000 miles was a significant amount of gas pipeline proposed.

The amount proposed in the more recent period, although less, still reflects healthy construction prospects for the near term.

Oil & Gas Journal's Worldwide Construction Report (OGJ, Oct. 28, p. 81) lists 110 individual pipeline projects totaling more than 8,700 miles of U.S. pipeline construction reported by surveyed compa-

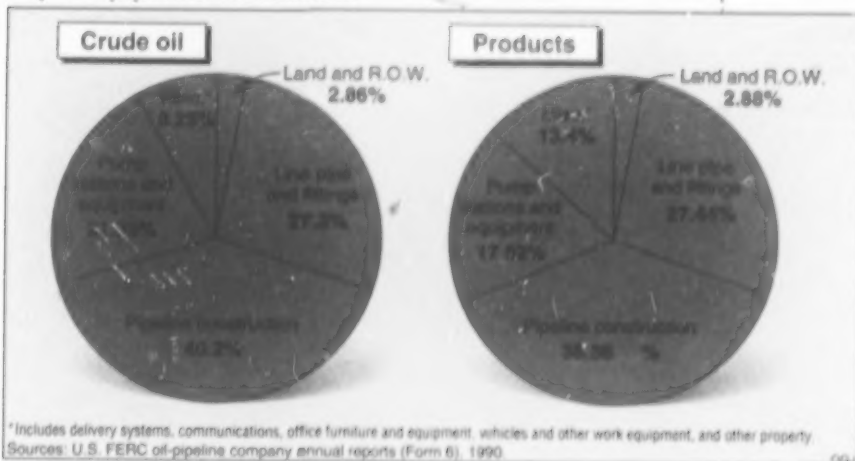
Top 10 interstate liquids pipelines—1990

Company	Mileage*	Company	Trunkline traffic, million bbl.-miles	Company	Income, \$1,000
1. Amoco Pipeline Co. (C)	12,185	Colonial Pipeline Co. (P)	881,381	BP Pipeline (Alaska) Inc. (C)	469,249
2. Mobil Pipe Line Co. (C)	9,647	Lakehead Pipe Line Co. Inc. (P)	346,896	Exxon Pipeline Co. (C)	278,008
3. Exxon Pipeline Co. (C)	19,350	BP Oil Pipeline Co. (C)	258,190	ARCO Pipe Line Co. (C)	206,320
4. Chevron Pipe Line Co. (P)	7,793	Explorer Pipeline Co. (P)	151,031	Colonial Pipeline Co. (P)	153,805
5. Conoco Pipe Line Co. (C)	7,519	ARCO Pipe Line Co. (C)	146,903	Lakehead Pipe Line Co. (C)	82,851
6. Shell Pipe Line Co. (C)	7,214	Amoco Pipeline Co. (C)	122,884	Amoco Pipeline Co. (C)	79,231
7. Mid-America Pipeline Co. (P)	7,120	Plantation Pipe Line Co. (P)	110,305	Chevron Pipe Line Co. (P)	76,519
8. ARCO Pipe Line Co. (C)	16,896	Explorer Pipeline Co. (P)	107,706	Shell Pipe Line Corp. (C)	66,741
9. Williams Pipe Line Co. (P)	6,674	Shell Pipe Line Corp. (C)	102,523	Mobil Pipe Line Co. (C)	57,860
10. Texaco Pipeline Co. (C)	6,400	Texaco Pipeline Co. (C)	87,381	Kuparuk Transportation Co. (C)	56,606
Total	79,982		2,124,910		\$1,527,090
Part of all companies, %	47.49		60.74		\$65.27
1989 totals	81,306		1,799,143		\$1,457,912

Source: U.S. FERC Form 6: Annual Report of Oil Pipeline Companies, Dec. 31, 1990.

*C = mostly or exclusively crude oil; P = mostly or exclusively product. †includes 818 miles for Trans-Alaska Pipeline; to avoid duplication, the total includes 818 miles only once.

Liquids-pipeline investment



nies as either proposed, planned, or under way.

By comparison, OGJ's Oct 15, 1990, construction report also listed 105 U.S. pipeline projects proposed, planned, or under way, totaling almost 12,000 miles.

The difference in mileages represents, to some extent, the withdrawal of a few large projects such as Wycal's Wyoming-California line.

Natural-gas pipeline projects reported in this year's construction report total more than 7,400 miles of pipeline. The report a year ago listed gas-pipeline projects totaling more than 10,500 miles.

Prospects for many of these lines being built are better now than at any time in

the last 5 years. The strong prospects for natural gas have much to do with this outlook combined with the shelving of several competing projects.

Nonetheless, many projects, primarily for gas-pipeline construction, continue to compete for the same markets, as Table 2 shows, or may still become uneconomical in the currently depressed natural-gas markets.

Crude-oil projects in the latest Oil & Gas Journal Worldwide Construction Report total 13 comprising more than 900 miles. The construction report a year ago also listed 13 crude-oil pipeline projects totaling more than 1,000 miles.

Finally, the latest Journal report shows six product-pipeline projects with more than 380 miles of pipeline. The report a year ago listed five totaling 350 miles.

Projects' actual costs

Table 2 reflects cost estimates for projects proposed to the FERC for construction approval. Not all projects proposed are built, however.

Actual costs for a project which is approved and built must be filed with the FERC within 6 months after the line's completion. That point is determined by the line's successful hydrostatic test, its commissioning date.

Table 3 shows such actual costs for projects completed

and reported to the FERC for the period Jan. 1, 1989, to June 30 of this year. Some of these projects may have been proposed or even approved much earlier than the surveyed period. Others may have been filed for, approved, and built less than a year before completion.

And in its initial filing, each of these projects may have been reported in segments. (That's how projects are broken out in Table 2.)

Completed-cost information, however, is reported to the FERC for an entire filing.

Nonetheless, this is the first time such actual-cost information has been published.

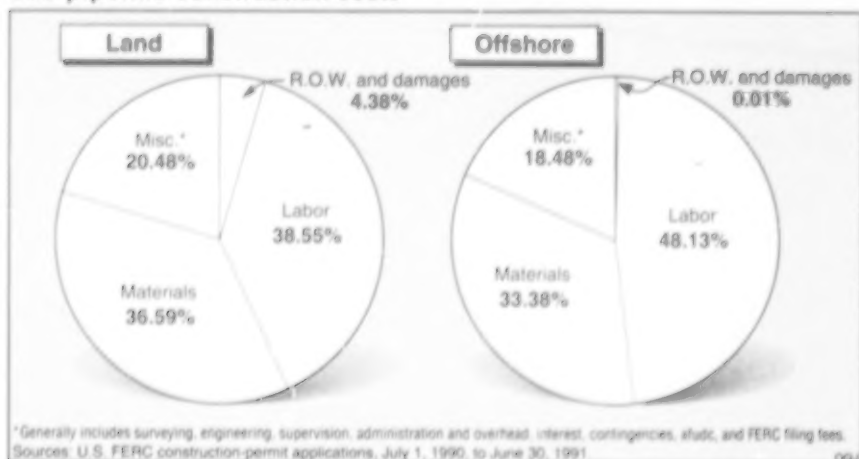
Overall, actual costs ex-

Top 10 U.S. gas-pipeline companies—1990

Company	Mileage Company	Sales, \$M	Company	Volumes moved for fee, Mscf	Company	Net income, \$1,000
1. El Paso Natural Gas Co.	20,282	Pacific Gas Transmission Co. 371,998	Transcontinental Gas Pipe Line Corp.	1,893,084	Tennessee Gas Pipeline Co.	658,665
2. Columbia Gas Transmission Corp.	18,928	Texas Eastern Transmission Corp. 363,863	Tennessee Gas Pipeline Co.	1,528,144	El Paso Natural Gas Co.	221,368
3. Northern Natural Gas Co.	16,485	Northwest Alaskan Pipeline Co. 342,223	Natural Gas Pipeline Co. of America	1,357,198	San Diego Gas & Electric Co.	207,841
4. Tennessee Gas Pipeline Co.	14,514	Natural Gas Pipeline Co. of America 298,008	Northern Natural Gas Co.	1,308,306	Natural Gas Pipeline Co.	204,345
5. Natural Gas Pipeline Co. of America	13,023	Northern Natural Gas Co. 273,812	El Paso Natural Gas Co.	1,249,406	ANR Pipeline Co.	151,135
6. Panhandle Eastern Pipe Line Co.	12,481	Transcontinental Gas Pipe Line Corp. 272,820	Columbia Gulf Transmission Co.	1,110,743	Northern Indiana Public Service Co.	140,099
7. K N Energy Inc.	12,245	Arkla Inc. 244,418	ANR Pipeline Co.	1,083,261	Northern Natural Gas Co.	103,764
8. ANR Pipeline Co.	12,122	Florida Gas Transmission Co. 207,734	Columbia Gas Transmission Corp.	790,085	Enserch Corp.	102,797
9. Transcontinental Gas Pipe Line Corp.	10,833	Michigan Consolidated Gas Co. 186,018	Northwest Pipeline Corp.	730,438	United Gas Pipe Line Co.	73,610
10. Enserch Corp.	10,320	Enserch Corp. 179,199	Panhandle Eastern Pipe Line Co.	730,345	Southern Natural Co.	67,618
Totals	141,213	2,729,288		11,991,011		\$1,831,270
Part of majors, %	86.86	59.08		57.99		85.63
Part of all companies, %	51.42	47.90		55.11		67.18
1989 totals	141,080	3,434,727		8,948,446		\$1,784,102

Source: U.S. FERC Forms 2s & 2As: annual reports for natural gas companies, Dec. 31, 1990.

Gas-pipeline construction costs



ceeded anticipated ones by almost \$18 million (9.36%).

The greatest variation occurred in estimated and actual costs for labor: For the projects reported, actual labor costs exceeded estimated ones by more than \$21 million (28.9%). R.O.W. and damages were underestimated by \$813,853 (11.3%).

Estimates for costs of materials and for miscellaneous items were closer; operators overestimated material costs by \$3.5 million (4.75%) and miscellaneous costs by \$505,052 (1.38%).

Subsequent Oil & Gas Journal Pipeline Economics Reports will continue reporting what companies tell the FERC they spend to build pipelines.

U.S. interstate network

Revenue, income, and

mileage changes cited earlier are evident on the pipeline-company tables (p. 57).

These data are based on annual reports of regulated interstate pipeline companies and provide a variety of detail on each of them, including pipeline mileage, crude oil and refined-products deliveries, natural-gas sales and gas transported for other companies, operating revenues, and net incomes.

Beginning with the 1988 Pipeline Economics Report (OGJ, Nov. 28, 1988, p. 33), the Journal began tracking volumes of gas transported for others by major interstate pipeline systems. This provides a method of keeping track of the changing nature of the U.S. gas-transmission industry.

System utilization

Comparisons between any

years of U.S. petroleum and natural-gas pipeline mileages must be made with care for two reasons.

The number of companies required to file reports with the FERC varies each year.

And, secondly, the FERC's system for classifying interstate natural-gas pipeline companies changed with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 55).

Since 1984, FERC-regulated gas pipeline companies have been classified as "major" or "nonmajor" based on total natural-gas transmissions for each of the 3 immediately previous reporting years. (See FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011.)

Major pipeline companies are those whose combined gas sold for resale and gas transported or stored for a

fee exceeded 50 bcf at 14.73 psi (60" F.) in each of the 3 previous calendar years.

Nonmajors are companies not classified as majors and which have had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60" F.) in each of the 3 previous calendar years.

One effect of this change has been that companies classified as nonmajor are exempt from filing certain data. Chief among the excluded figures are mileage and gas-sales or transportation figures.

Many nonmajor companies nonetheless file such data voluntarily, but consistency exists only among major companies.

In comparisons, figures for nonmajor companies should be excluded from a calculation of total U.S. interstate pipeline utilization for any given year because of their unreliability year to year.

Therefore, combining 1990 mileage data for all regulated liquids-pipeline companies (168,364) with mileage reported by the major natural-gas pipeline companies (46 companies reporting 248,334 miles) yields a total figure of 416,698. This represents a 1.5% increase of 6,376 miles over comparable figures reported for 1989 (168,637 + 241,685 = 410,322).

The 1989 figures represented a decline from 1988's total of 424,522 miles.

This compares with a small

Pipeline company revenues, incomes

Table 1

	Gas		Oil	
	Operating rev., \$1,000	Net income, \$1,000	Operating rev., \$1,000	Net income, \$1,000
1981	57,782,316	3,810,586	6,678,039	2,030,667
1982	64,850,546	3,595,041	7,140,469	2,162,447
1983	66,281,736	3,565,776	7,472,286	2,352,748
*1984	64,006,035	3,055,790	7,823,582	2,544,764
*1985	56,252,921	5,190,817	7,460,847	2,430,845
*1986	40,664,635	1,653,010	7,287,062	2,051,372
*1987	31,596,171	1,438,203	7,057,264	2,475,411
*1988	32,736,380	1,572,609	6,861,936	2,504,986
*1989	32,343,805	2,494,236	6,511,997	2,226,627
*1990	32,195,898	2,877,508	7,148,541	2,339,609

Sources: U.S. FERC annual reports (Forms 2, 3A, and 6) by regulated interstate natural-gas and liquids pipeline companies.
 *Major and nonmajor companies under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. See table GAS COMPANIES, p. 60, for definition of major and nonmajor companies.

Current pipeline costs

Size, in.	Location*	Length miles	Cost, \$				R.O.W. & damages	Total	\$/mile
			Material	Labor	Misc.†				
LAND PIPELINES									
6	Oregon (R.C.)	0.30	10,500	304,100	26,020	1,600	343,220	1,140,733	
6	Washington	1.65	65,725	117,700	48,357	5,800	237,582	143,989	
6	Oregon (R.)	14.53	591,000	2,397,900	381,602	51,900	3,422,402	235,540	
8	Connecticut (R.C.)	0.09	51,900	300,800	412,270	47,400	812,370	9,026,333	
8	Connecticut (R.)	0.56	8,500	117,200	329,990	56,400	511,090	912,661	
8	Nevada	2.60	109,320	151,037	76,432	16,000	352,789	135,688	
8	Connecticut (R.)	7.43	602,000	3,130,300	1,999,940	571,300	6,363,540	856,466	
8	North Dakota	49.30	1,754,286	1,685,200	691,940	—	4,131,426	83,802	
10	Oregon	0.20	14,700	546,700	68,237	3,200	632,837	3,164,185	
10	Nevada	0.66	56,220	376,780	94,668	—	529,668	802,527	
10	Oregon	0.84	45,400	100,200	34,712	17,300	197,612	235,252	
10	Missouri	2.00	105,550	213,360	62,472	—	381,382	381,382	
10	Pennsylvania	12.31	1,421,528	4,549,359	1,047,273	395,840	7,414,000	599,353	
10	Oregon	25.10	1,899,400	3,093,800	894,571	440,700	6,328,471	180,298	
12	Oregon (C.)	0.10	13,700	423,200	47,729	3,200	487,829	4,878,290	
12	Wyoming	0.43	117,800	137,400	73,950	8,600	337,750	778,488	
12	Massachusetts (L.)	1.13	573,000	2,898,000	428,200	715,000	4,612,000	1,487,742	
12	Oregon	1.40	338,400	554,400	167,366	67,800	1,128,466	208,975	
12	Oregon	16.33	1,134,800	1,628,400	559,819	226,200	3,749,219	204,540	
16	Oregon (C.)	0.15	14,200	471,700	49,531	3,200	538,631	5,386,310	
16	Ohio	0.34	67,200	61,200	16,117	1,400	144,917	428,208	
16	Ohio	0.81	70,900	139,100	20,118	2,300	232,418	286,936	
16	Ohio	0.91	54,700	151,600	21,816	3,300	261,416	287,273	
16	Oregon	5.10	497,300	718,900	207,192	139,800	1,563,092	274,227	
16	Oregon	14.40	1,217,700	1,760,000	502,423	347,700	3,827,823	265,446	
16	Idaho	31.91	3,450,400	7,863,100	1,700,366	15,300	13,029,166	408,329	
20	Oregon (C.)	0.20	34,700	380,900	26,727	2,200	444,527	1,481,757	
20	Oregon	1.24	181,600	776,400	140,480	274,300	1,372,780	1,107,081	
20	Ohio	1.42	193,000	258,200	42,853	7,500	501,553	353,206	
20	Oregon (C.)	1.59	514,700	4,399,100	431,748	15,800	5,361,348	3,749,275	
20	Oregon	1.86	364,200	1,107,400	255,598	53,300	1,680,498	903,494	
20	Washington	3.85	536,500	1,701,700	493,800	107,900	2,839,900	737,654	
20	West Virginia	4.50	689,300	1,033,500	612,554	81,000	2,416,354	536,923	
20	Ohio	7.40	1,082,900	2,287,332	1,419,089	463,600	5,252,989	709,863	
20	Wyoming	13.24	2,251,700	3,448,800	1,688,800	140,200	7,507,500	567,032	
20	Wyoming	20.49	2,524,000	5,043,000	1,255,000	295,000	8,917,000	337,579	
20	Kansas	28.40	3,877,000	5,399,000	1,116,000	283,000	8,675,000	301,937	
20	New York	28.44	4,640,200	7,659,600	4,806,447	1,396,400	18,487,647	650,058	
20	Colorado	82.50	8,126,000	10,840,000	3,371,384	1,042,000	24,181,384	293,108	
20	Wyoming	140.72	14,572,000	14,444,000	7,211,362	1,778,000	37,005,362	264,430	
22	Colorado	270.30	45,641,176	42,571,908	22,270,475	2,383,528	112,967,107	418,397	
24	Oregon	0.10	20,000	381,800	34,625	2,600	439,025	4,390,250	
24	Washington	0.30	34,000	169,600	33,716	3,400	200,716	306,918	
24	New Jersey	4.40	1,289,272	4,542,615	635,715	851,400	7,119,002	1,617,955	
24	Oregon	5.50	846,100	1,527,300	300,260	84,500	2,764,160	552,832	
24	Utah	8.27	657,100	1,554,500	344,960	2,300	2,758,860	523,503	
24	Utah	7.33	1,164,300	1,712,600	457,004	11,000	3,344,904	443,034	
24	Wyoming	9.61	1,244,500	1,894,500	449,804	37,200	3,426,004	397,448	
24	Wyoming	9.92	1,413,400	2,610,200	517,077	40,400	4,581,077	507,880	
24	Oregon	9.99	1,600,800	2,889,300	575,809	159,900	5,225,809	527,859	
24	Massachusetts	10.75	4,488,900	13,359,000	1,667,646	5,000,000	24,215,546	2,263,135	
24	Colorado	10.75	1,582,200	2,822,900	612,591	16,200	4,843,391	451,809	
24	Utah	11.67	1,750,500	2,574,700	628,691	55,300	5,009,191	429,237	
24	Utah	12.12	1,750,700	2,574,800	629,091	55,300	5,009,891	414,041	
24	Idaho	14.66	2,195,800	2,559,500	683,321	24,700	5,463,321	372,669	
24	Utah	16.50	2,266,200	3,358,800	778,679	31,700	6,434,979	428,999	
24	Idaho	18.31	2,369,200	2,225,400	827,279	41,700	5,463,779	422,193	
24	Pennsylvania	18.38	1,130,900	5,165,700	2,388,404	634,700	11,319,704	707,693	
24	New York	11	1,405,700	6,141,500	2,795,287	862,900	13,025,387	735,896	
24	Idaho	18.71	2,738,700	3,171,200	881,809	48,900	6,841,608	364,497	
24	Idaho	19.62	2,973,100	5,002,800	1,078,339	88,000	9,141,839	466,950	
24	Idaho	20.81	2,384,100	7,188,700	1,147,700	120,800	11,823,300	568,155	
24	Colorado	26.86	4,229,100	5,409,100	1,323,456	258,000	11,019,256	410,248	
24	Wyoming	30.29	4,407,400	5,588,400	1,147,598	74,800	10,188,198	336,289	
24	Idaho	31.43	4,655,900	5,630,200	1,358,514	444,600	12,109,214	399,580	
24	Colorado-New Mexico	41.00	6,940,804	6,474,072	3,401,962	262,472	17,179,330	419,008	
24	Oklahoma	42.28	6,529,000	5,758,000	1,191,219	1,056,000	14,534,219	338,231	
24	Colorado	50.31	7,016,400	7,908,000	2,373,848	234,400	17,841,548	354,264	
24	Idaho	60.92	9,047,000	13,856,700	2,801,830	327,900	26,034,030	427,348	
24	Oklahoma	62.75	9,270,000	8,526,000	1,766,185	1,664,000	21,226,185	338,226	
24	Colorado	68.54	10,018,500	11,149,140	3,141,843	177,300	24,486,483	357,035	

increase for 1988 over 1987 of 4,210 miles for all liquids and major natural-gas pipe-

lines. Whether a liquids pipeline company must file an FERC

annual report (Form No. 1) is determined by whether the FERC designates the company

as an interstate common-carrier pipeline. These reports for 1990

Table 2

Size, in.	Location*	Length, miles	Cost, \$				Total	\$/mile
			Material	Labor	Misc.†	R.O.W. & damages		
30	Washington	0.11	40,200	339,900	33,725	5,300	419,125	3,810,227
30	New Mexico	0.16	292,000	348,000	222,287	—	762,287	4,763,044
30	Mississippi	1.59	791,937	790,525	353,564	38,250	1,974,276	1,241,683
30	Iowa (C)	2.00	470,000	5,290,000	2,008,383	331,072	9,099,455	4,549,728
30	New York	6.50	2,101,000	3,053,000	1,474,786	74,000	6,702,786	1,031,198
30	New York	9.59	3,472,500	4,090,200	3,770,961	306,000	9,639,761	1,025,840
30	Washington	10.64	3,500,900	3,640,800	1,060,888	65,100	8,269,688	777,526
30	Washington	13.87	4,363,100	4,365,300	1,307,694	73,700	10,109,794	728,796
30	Washington	14.36	4,724,100	4,913,700	1,437,356	87,900	11,163,056	777,413
30	Illinois	15.00	4,316,500	2,192,200	1,393,094	900,000	9,001,794	600,120
30	New York	18.20	4,995,800	7,477,900	4,858,651	577,600	17,909,951	964,929
30	New Mexico	50.00	78,000	78,000	41,304	—	217,304	4,340
30	Mississippi	93.20	27,313,000	19,968,000	12,893,000	2,873,000	61,047,000	660,408
30	New Mexico	96.80	23,921,000	27,863,740	21,480,466	5,341,561	78,606,767	812,214
30	N.M.-Ariz.-Calif. (L)	199.00	43,123,455	64,369,252	47,617,333	8,428,060	163,538,100	821,804
30	Louisiana	222.50	54,120,700	56,307,200	38,408,480	6,477,000	155,313,380	698,937
30	Iowa	230.60	71,497,000	42,540,000	34,285,984	9,691,872	154,024,856	667,931
34	Arizona	18.10	5,377,000	3,748,000	2,763,471	1,096,700	12,985,171	717,264
34	Arizona	41.90	12,749,400	11,700,000	6,621,545	612,700	31,683,645	753,793
36	Michigan	0.40	181,200	914,200	143,187	14,800	853,387	2,133,468
36	Michigan	0.80	365,600	743,800	251,775	26,300	1,391,475	1,738,844
36	Iowa-Illinois (C)	0.83	503,200	1,357,000	126,790	48,400	1,935,390	2,333,482
36	New Jersey	0.95	604,200	1,449,219	144,497	80,700	2,278,616	2,461,053
36	Arizona	1.80	746,000	832,000	355,998	34,000	1,968,996	982,220
36	Michigan	2.90	730,700	1,085,800	544,980	74,000	2,335,480	1,467,743
36	Minnesota	2.40	879,500	1,416,600	681,681	88,800	3,066,581	1,261,034
36	Minnesota	3.10	1,142,000	1,863,200	762,203	114,800	3,882,203	1,252,001
36	New York	9.00	1,499,800	2,059,000	1,305,011	306,200	5,170,111	1,267,528
36	Pennsylvania	4.00	3,089,300	3,972,300	434,912	215,397	7,712,000	1,564,300
36	Massachusetts	0.08	1,743,300	3,387,600	1,800,710	393,100	7,324,710	1,447,030
36	Minnesota	0.10	1,740,400	2,317,600	1,172,699	168,800	5,419,599	1,962,725
36	Pennsylvania	1.67	4,414,872	5,648,580	6,683,152	228,100	16,974,704	2,975,614
36	Minnesota	1.90	3,105,400	3,675,700	1,466,397	218,400	7,415,997	1,290,847
36	New York	8.00	2,528,600	3,223,200	2,289,847	347,600	8,389,247	1,397,875
36	New York	7.70	2,691,100	3,512,300	2,369,131	312,000	8,884,531	1,250,614
36	Iowa	1.47	2,647,600	1,743,600	480,392	299,300	5,171,092	3,475,795
36	Arizona	0.00	1,927,000	2,692,000	1,457,814	146,000	7,124,814	895,602
36	Michigan (L)	3.00	2,914,380	3,391,300	2,235,360	432,000	8,973,040	1,224,620
36	Illinois	8.75	3,496,200	1,978,500	872,328	590,300	6,897,328	795,572
36	New Mexico	15.50	5,412,000	4,078,000	2,967,471	566,000	13,023,471	860,224
36	Arizona	16.20	4,935,000	3,891,000	2,731,418	950,000	12,507,418	772,063
36	Arizona	20.10	6,681,000	7,031,000	3,739,996	344,000	17,795,996	885,249
36	Iowa	28.45	10,295,200	4,562,000	2,463,778	1,119,000	20,439,978	1,791,156
36	Louisiana-Miss. (C)	45.50	19,633,500	15,782,000	9,172,904	2,880,000	47,368,404	1,046,188
36	Texas	46.90	18,854,000	10,360,000	10,422,900	846,000	40,482,900	861,043
36	Arizona	54.40	16,267,000	12,768,000	4,346,307	840,000	34,221,307	702,598
36	Illinois	68.86	24,602,100	13,959,700	5,654,988	4,132,600	48,349,388	702,140
36	Texas	73.10	24,441,000	15,025,000	13,989,288	1,330,000	54,785,288	741,221
42	New Jersey	1.66	2,913,880	8,714,480	798,530	550,000	9,976,890	2,695,902
42	New Jersey	4.08	2,406,180	8,008,480	848,620	496,750	10,760,030	2,487,745
42	New Mexico	14.20	6,142,000	4,048,000	3,443,681	1,234,000	14,868,681	1,046,609
42	New Mexico	18.20	7,886,000	4,706,000	4,364,078	1,600,000	18,556,078	1,019,235
42	New Mexico	27.00	8,853,000	5,312,000	4,935,363	1,624,000	20,724,363	996,398
Total land projects		3,026.15	\$664,378,935	\$699,948,342	\$371,730,260	\$79,457,822	\$1,815,513,359	\$596,747
1989 report total-land		7,230.96	\$2,479,581,871	\$2,188,136,800	\$1,150,306,546	\$223,043,560	\$6,058,068,477	\$830,882
OFFSHORE PIPELINES								
10	Texas	9.42	1,396,100	3,076,400	1,075,150	240	5,547,790	601,400
16	Louisiana	8.17	1,679,353	4,313,100	1,193,771	193	7,240,420	1,254,525
16	Louisiana	20.46	4,413,600	2,940,200	1,791,500	2,500	9,287,800	453,939
Total offshore projects		36.05	\$7,489,053	\$11,056,403	\$4,245,421	\$2,933	\$22,975,810	2,339,865
1989 report total-offshore projects		60.08	\$22,791,596	\$17,047,305	\$11,192,671	\$1,114,050	\$50,110,142	\$834,057
TOTAL ALL PROJECTS		3,062.20	\$672,047,988	\$711,004,745	\$375,975,681	79,460,755	\$1,838,489,169	\$597,222
1989 report total		7,291.03	\$2,502,343,467	\$2,199,274,105	\$1,161,499,117	\$224,157,610	\$6,058,179,619	\$830,908

Source: U.S. FERC construction permit applications, July 1, 1988, to June 30, 1989.

* L - Large R - Replacement C - Road to original crossing † Damages include surveying, right-of-way interest, and a surficial contingency study and FERC fees.

show that gathering lines decreased by 1,000 miles (3%) and crude lines by

160 miles (3.25%). Replacement lines increased by 861 miles (1.5%) over total in-

ventory in 1989. These figures are in line with the steady pattern of re-

placement utilization for the past 10 years (Table 4). Natural-gas transmission

lines for all companies were flat compared with 1989's, up by 1,227 miles (0.45%), and up slightly for major companies, by 6,649 miles (2.75%).

Field lines for all companies showed a small decrease of 1,053 miles (-1.67%) and, among major companies, a loss of 945 miles (-1.72%).

For all companies, storage lines decreased last year over 1989: down 1,227 (-0.45%) but gained fractionally for majors, up 23 (0.54%).

Deliveries

Throughput for liquids-pipeline companies in 1990 was essentially flat when compared with 1989.

And for all natural-gas pipelines, sales of gas fell significantly in 1990, by almost 1.4 tcf (-19.5%), and for majors, by more than 934 bcf (-16.8%).

These latter figures reflect the ongoing major story of the pipeline industry: the shift of natural-gas pipeline companies to transporters of gas from their historic role as buyers of gas for resale.

This shift has been evolving for almost 7 years and was evident in 1990 in the volumes of gas regulated interstate pipeline companies transported for others.

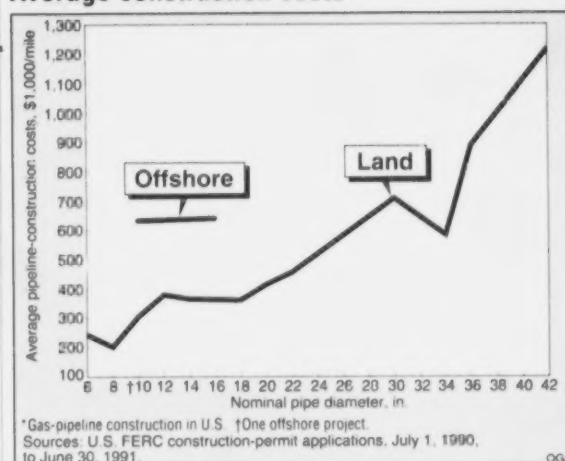
For last year, all regulated U.S. interstate gas pipelines carried more than 21 tcf of gas for others; of those volumes, majors carried almost 20 tcf.

For all companies, volumes of gas transported for others rose by more than 1.9 tcf (10%) when compared to volumes carried in 1989; for majors, the rise was more than 2.8 tcf (16.5%).

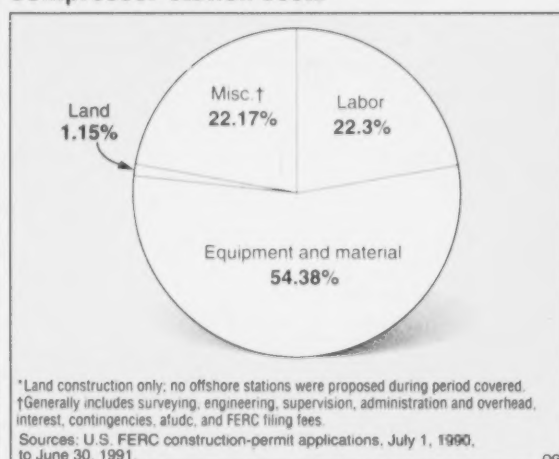
Volumes of gas transported for others in 1990 by all interstate gas-pipeline companies (21.08 tcf) comprised 78.6% of total volumes (26.8 tcf) moved through the U.S. system, up from 72.9% for 1989 and from 68% for 1988.

For major companies (whose total volumes exceeded 24.6 tcf), the share was a bit larger: more than 81.2%. This share also represented an increase over the 1989 figure, up from 75.5%, and over the 1988 figure, up

Average construction costs*



Compressor-station costs*



from 71%.

Crude-oil and product deliveries last year approached 11.4 billion bbl, a minimal increase over 1989 of 97.4 million bbl (0.86%).

Crude-oil deliveries through the U.S. interstate system rose slightly last year by 127.9 million bbl (1.99%). At the same time, product deliveries declined by 30.5 million bbl (-0.63%).

Trunkline traffic for U.S. crude-oil and product pipelines also showed a small decline last year when compared to 1989. It fell by 4.9 billion bbl-miles (-0.14%) over that for 1989.

Crude-oil trunkline traffic declined 27 billion bbl-miles (-1.41%). Product traffic

rose slightly, by 22 billion bbl-miles (1.4%).

Rankings

Oil & Gas Journal ranks the top 10 natural-gas and liquids pipeline companies in three categories (mileage, barrel-mile throughput, and operating income) for oil pipeline companies and four categories (mileage, natural-gas sales, volumes transported for others, and operating income) for natural-gas pipeline companies (pp. 42-43).

These rankings are broken out from the pipeline-company tables (pp. 57-60).

For all natural-gas pipeline companies, net income as a portion of gas-plant investment continued a trend which

began in 1988.

This portion stood at 5.2% for 1990, up from 4.6% for 1989, and 3.1% for 1988. The 1988 figure was up from 2.9% in 1987. It was 3.4% in 1986, 4.5% in 1985, and 8.7% in 1984.

For major gas pipelines, net income as a portion of gas-plant investment countered the trend, hitting 4.7% for 1990 after reaching 4.8% in 1989. The figure had risen to 3.2% for 1988. It fell to 2.6% in 1987 from 3.2% in 1986. It was 4.3% in 1985, and 7.6% in 1984.

The term "gas plant" refers to the physical facilities—compressors, metering stations, and pipelines—used to transport natural gas.

For 1990, all gas companies reported an industry gas-plant investment totaling almost \$55.3 billion compared to \$54.2 billion for 1989 and \$51 billion for 1988.

Majors' gas-plant investment in 1990 was \$47.9 billion compared to \$44.1 billion for 1989 and \$44 for 1988.

For interstate common-carrier liquids pipeline companies, net income as a percentage of investment in carrier property held at 9% for 1990, the same as in 1989. In 1988 it was 10.3%; in 1987, 11.6%.

Liquids pipelines' investment in carrier property for 1990 increased by almost \$1.2 billion (4.8%) to \$25.8 billion over 1989 which had shown a smaller \$306 million (1.26%) increase over 1988.

Another measure of the profitability of oil and natural-gas pipeline companies in recent years is the percentage net income represents of operating income. Through 1987, trends for liquids-pipeline companies and for natural-gas pipeline companies had been heading in opposite directions for 10 years.

For liquids-pipeline companies in 1990, income as a portion of operating revenues fell to 32.7% from 34.2% for 1989 and 36.5% for 1988.

By contrast for all natural-gas pipeline companies, income as a percentage of operating revenues has been recovering in recent years.

Last year saw a continued strengthening in this area:

Table 3

Pipeline costs: estimated vs. actual, 1989-91*

Size, in., and location	Length, miles	Costs, \$				Total	\$/mile
		Materials	Labor	Misc.	R.O.W. & damages		
Land pipelines							
6 Kentucky	4.88						
Estimated		411,900	557,300	1,454,100	16,500	2,439,800	499,959
Actual		277,450	792,410	1,115,010	11,360	2,196,230	450,047
8 Tennessee (L)	1.10						
Estimated		76,500	100,580	39,070	25,850	242,000	220,000
Actual		72,668	110,603	40,275	15,542	239,088	217,353
8 Wyoming	435						
Estimated		311,000	287,000	183,940	16,000	797,940	183,434
Actual		317,544	322,998	121,508	11,425	773,475	177,810
10 Connecticut	0.90						
Estimated		160,500	707,200	586,100	141,200	1,595,000	1,772,222
Actual		159,882	742,831	546,174	175,390	1,624,277	1,804,752
10 Massachusetts	0.54						
Estimated		63,200	204,450	71,510	1,000	340,160	629,926
Actual		71,411	214,539	72,705	980	359,635	665,991
12 Oklahoma	12.40						
Estimated		977,000	715,500	275,050	386,700	2,354,250	189,859
Actual		839,000	690,600	276,000	563,000	2,368,600	191,016
16 Pennsylvania (L)	2.25						
Estimated		511,101	852,445	382,254	35,450	1,751,250	778,333
Actual		512,864	935,814	453,105	58,015	1,959,798	871,021
16 North Carolina	7.50						
Estimated		776,700	2,159,600	758,111	185,700	3,880,111	517,348
Actual		701,464	1,931,589	432,096	116,335	3,181,484	424,198
16 Indiana (L)	59.01						
Estimated		6,274,000	7,767,000	2,798,520	1,302,000	18,141,520	307,431
Actual		5,822,704	10,980,941	2,719,060	1,459,952	20,982,657	355,578
20 Texas-Louisiana	5.60						
Estimated		954,000	766,000	245,000	90,000	2,055,000	366,964
Actual		856,829	597,736	198,043	148,967	1,801,575	321,710
20 Kentucky (L)	3.42						
Estimated		515,000	603,000	162,620	81,000	1,361,620	398,135
Actual		436,585	653,432	210,455	31,364	1,331,836	389,426
20 Indiana (L)	68.28						
Estimated		9,614,000	10,639,000	3,824,920	1,968,000	26,045,920	381,458
Actual		8,517,188	14,002,414	4,233,469	3,652,477	30,405,548	445,307
20 Utah	81.60						
Estimated		9,042,950	6,434,600	3,869,100	368,900	19,715,550	241,612
Actual		8,536,743	10,713,206	5,247,886	324,345	24,822,180	304,193
22 Tennessee (C)	0.48						
Estimated		325,000	857,600	375,680	8,000	1,566,280	3,263,083
Actual		324,473	1,213,038	186,036	1,285	1,724,832	3,593,400
24 Pennsylvania	27.60						
Estimated		4,466,500	7,564,800	1,632,700	1,456,000	15,120,000	547,826
Actual		4,113,100	12,035,500	2,115,200	259,800	18,523,600	671,145
30 Pennsylvania (L)	5.15						
Estimated		1,921,425	2,870,686	1,162,889	82,400	6,037,400	1,172,311
Actual		1,922,747	2,477,263	999,295	99,942	5,499,247	1,067,815
36 Pennsylvania (L)	8.22						
Estimated		4,190,223	4,786,946	2,094,981	263,300	11,335,450	1,379,009
Actual		4,413,958	5,103,026	2,402,903	336,162	12,256,049	1,491,004
42 Georgia	12.05						
Estimated		5,462,610	3,995,160	2,592,490	327,760	12,378,020	1,027,221
Actual		5,103,883	5,667,962	3,581,906	359,958	14,713,709	1,221,055
48 Alabama	15.17						
Estimated		8,743,954	5,975,585	3,973,679	461,130	19,154,348	1,262,647
Actual		8,757,285	6,147,753	4,825,912	404,593	20,135,543	1,327,326
Total land	320.50						
Estimated		\$54,797,563	\$57,844,452	\$26,452,714	\$7,216,890	\$146,311,619	\$456,511
Actual		\$51,757,778	\$75,333,655	\$29,777,038	\$8,030,892	\$164,899,363	\$514,507
Offshore pipelines							
10 Louisiana	4.02						
Estimated		372,739	542,080	397,809	100	1,312,728	326,549
Actual		439,720	718,394	225,763	102	1,383,979	344,273
16 Louisiana	10.22						
Estimated		1,762,344	1,225,800	1,142,096	245	4,129,485	404,059
Actual		1,554,487	1,293,540	562,560	172	3,410,759	333,734
16 Louisiana	26.57						
Estimated		4,965,097	3,195,783	2,887,210	499	11,048,589	415,829
Actual		4,989,580	4,181,227	1,315,608	478	10,486,893	394,689
20 Louisiana	25.39						
Estimated		4,645,439	5,134,038	3,415,440	476	13,195,393	519,708
Actual		4,659,377	4,821,843	1,399,178	419	10,880,817	428,547
24 Louisiana	20.03						
Estimated		7,809,000	5,200,000	2,237,830	—	15,246,830	761,200
Actual		7,421,000	7,916,900	2,746,900	—	18,084,800	902,886
Total offshore	86.23						
Estimated		\$19,554,619	\$15,297,701	\$10,079,385	\$1,320	\$44,933,025	\$521,083
Actual		\$19,064,164	\$18,931,904	\$6,250,009	\$1,171	\$44,247,248	\$513,131
Total land + offshore							
Estimated	406.73	\$74,352,182	\$73,142,153	\$36,532,099	\$7,218,210	\$191,244,644	\$470,200
Actual		\$70,821,942	\$94,265,559	\$36,027,047	\$8,032,063	\$209,146,611	\$514,215

Source: U.S. FERC completed-project cost filings, Jan. 1, 1989, to June 30, 1991, under CFR Section 157.20(c)(4).

*Actual cost data must be filed within 6 months following final hydrostatic test of pipeline. Not all projects proposed (estimated costs) are built (actual costs). L = Loop; C = River or channel crossing.

†Generally includes engr. supv., surveying, interest, administration and overheads, contingencies, and FERC fees.

net income of all companies as a portion of operating revenues was 8.9% compared to 7.7% for 1989 and 4.8% for 1988.

For majors in 1990, income as a percentage of operating revenues was 8.7% after being 8.2% in 1989 and 5.3% in 1988.

Tracked companies

In this annual Pipeline Economics Report, Oil & Gas Journal has for several years been tracking investment by five crude-oil pipeline companies and five products-pipeline companies.

Table 5 indicates that investment by the five crude-oil pipelines stood at \$1.82 billion at the end of 1990 compared to \$1.75 billion at the end of 1989. That year's figure compares with \$1.71 billion at the end of 1988.

Investment by the five products pipeline companies was \$3.01 billion for 1990 compared to \$2.942 billion at the end of 1989 and \$2.934 billion at the end of 1988.

Fig. 2 illustrates the investment split in the crude-oil and products pipeline companies.

U.S. interstate pipeline mileage

Table 4

Year	Gas	Miles Liquid	Total
1981	274,634	172,815	447,449
1982	286,999	172,549	459,548
1983	285,204	167,819	453,023
1984	258,379	173,922	432,301
1985	279,395	171,401	450,796
1986	281,861	170,014	451,875
1987	280,085	167,865	447,950
1988	281,361	170,457	451,838
1989	273,401	168,637	442,038
1990	274,628	168,364	442,992

Source: U.S. FERC Form 6 annual reports—oil pipelines, Forms 2 & 2A—gas pipelines.

*Reflects operating mileage as reported under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. Only major gas-pipeline companies are required to file mileage. See table GAS COMPANIES, p. 60, for definition of major and nonmajor companies and details of companies reporting mileage for 1990.

Construction activity

As Fig. 2 shows, the costs of line pipe and fittings and of laying pipelines make up more than 67% of the cost of a pipeline system. These elements of pipeline construction costs have risen very little for the past few years, after rapidly increasing before 1982.

Cost trends

Table 6 lists a 10-year land-construction cost trend

for natural-gas pipelines with diameters ranging from 8 to 36-in.

The table's data are based on a mix of actual costs of completed pipeline construction and projected costs filed under CP dockets with the FERC.

As the table reflects, the average cost per mile for any given diameter may fluctuate from one year to the next as projects' costs are affected by geographic location, terrain, population density, or

other factors.

The cost-per-mile trends from 1990 to 1991 are up, with four of seven diameter classifications showing increases. These are for 8, 24, 30, and 36-in. categories.

Yearly fluctuations in these figures are illustrated in construction figures for a 12-in. pipeline. These had leaped between 1984 and 1985 by 90%, fell in 1988 by more than 30%, jumped again in 1990 by 233%, then fell for 1991 by 68%.

Plans and miles

Table 2 lists 126 land-pipeline construction projects and 3 offshore for a total of 129, compared to 169 land and 2 offshore reported in last year's Pipeline Economics Report.

Land projects proposed during the period surveyed represent more than 3,050 miles of pipeline at an estimated price tag of more than \$1.8 billion and three offshore projects totaling 36 miles estimated to cost of almost \$23 million.

Total estimated costs for these projects, land and off-

Investment in liquids pipelines

Table 5

	Company and investment, \$					Total, \$	%
	A	B	C	D	E		
CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	2,224,047	814,497	292,759	1,028,858	1,230,339	5,590,530	0.31
Right-of-way	12,288,388	1,006,210	316,392	16,762,182	16,147,724	46,520,896	2.56
Line pipe	138,201,963	25,703,218	7,797,471	98,709,405	163,529,084	433,941,141	23.85
Line pipe fittings	10,642,039	962,984	1,386,293	18,837,972	30,926,806	62,776,094	3.45
Pipeline construction	204,582,562	27,837,622	10,931,879	228,925,084	259,264,943	731,542,090	40.20
Buildings	27,877,166	5,016,815	2,568,027	14,891,186	11,797,326	62,150,520	3.42
Boilers	—	—	—	—	—	—	—
Pumping equipment	25,682,665	5,556,816	2,423,767	19,946,720	48,562,327	102,172,295	5.61
Machine tools and machinery	—	—	—	33,938	—	33,938	0.00
Other station equipment	108,501,425	23,349,854	4,712,701	50,480,879	37,899,437	224,944,296	12.36
Oil tanks	20,548,637	6,062,241	5,678,530	17,158,157	28,808,759	78,256,324	4.30
Delivery facilities	—	3,974	5,489,526	1,541,785	6,767,880	13,803,165	0.76
Communications systems	1,027,990	3,308,033	77,391	12,506,265	4,565,272	21,484,951	1.18
Office furniture and equipment	3,994,980	321,665	288,444	3,872,227	834,776	9,312,082	0.51
Vehicles and other work equip.	11,593,568	1,120,571	506,689	7,259,160	450,618	20,930,606	1.15
Other property	—	1,545,484	—	—	4,748,992	6,294,476	0.35
Total	\$567,165,430	\$102,629,984	\$42,469,853	\$491,953,848	\$615,534,273	\$1,819,753,404	100.00
PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	4,434,304	1,763,961	591,807	1,169,417	3,846,831	11,806,320	0.39
Right-of-way	29,813,107	10,842,600	18,766,972	8,891,885	6,817,610	75,132,174	2.49
Line pipe	346,176,949	67,685,854	101,419,158	87,383,834	97,996,697	700,622,492	23.23
Line pipe fittings	73,542,993	12,961,173	15,460,544	1,743,152	22,311,631	126,929,493	4.21
Pipeline construction	588,032,243	109,853,713	195,066,240	102,037,492	162,229,915	1,157,219,603	38.37
Buildings	24,617,881	4,113,837	5,035,979	11,604,925	18,099,434	63,472,056	2.10
Boilers	—	—	—	—	—	—	—
Pumping equipment	45,231,924	6,166,137	29,148,659	28,990,682	20,472,774	130,010,176	4.31
Machine tools and machinery	—	—	—	—	501,777	501,777	0.02
Other station equipment	124,807,134	21,947,881	37,269,731	25,648,655	136,753,967	346,427,368	11.49
Oil tanks	50,505,451	18,197,220	9,079,107	20,262,896	75,943,852	173,988,526	5.77
Delivery facilities	—	—	8,445,974	12,957,782	55,550,434	76,954,190	2.55
Communication systems	2,019,811	646,028	2,453,805	10,863,024	—	15,982,668	0.53
Office furniture and equipment	11,243,580	2,662,160	3,264,406	719,294	1,289,649	19,179,089	0.64
Vehicles and other work equip.	8,757,496	2,081,707	8,894,689	3,091,836	2,738,110	25,563,838	0.85
Other property	73,347,765	—	19,129,520	—	—	92,477,285	3.07
Total	\$1,382,440,638	\$258,922,271	\$454,026,591	\$315,364,874	\$605,352,581	\$3,016,307,055	100.00

Source: U.S. FERC Form 6, Annual Report of Oil Pipeline Companies, Dec. 31, 1990.

Table 6

10-year land construction cost trends

Size	Year*	R.O.W.	Material	Average cost, \$/mile		Total	Range, \$/mile	
				Labor	Misc.		Low	High
8 in.	1991	11,522	43,114	89,772	58,512	202,921	83,802	19,026,333
	1990	7,814	44,573	89,295	40,018	181,700	79,250	305,561
	1989	33,945	130,785	330,581	83,558	578,869	520,307	692,570
	1988	7,619	58,695	56,381	37,353	160,058	116,856	220,000
	1987	20,032	55,430	75,568	30,581	181,611	151,193	652,036
	1986	14,763	44,703	63,102	32,958	155,527	137,033	193,846
	1985	3,141	28,144	47,317	16,283	94,884	64,203	228,866
	1984	22,339	49,974	175,733	74,086	322,132	223,767	540,655
	1983	6,244	48,392	89,600	23,088	167,324	159,940	178,020
	1982	8,996	46,002	67,950	31,769	154,717	73,596	572,926
12 in.	1991	37,200	79,613	213,538	46,559	376,910	204,540	14,878,290
	1990	105,535	142,336	353,859	232,572	834,302	637,540	1,591,653
	1989	43,896	96,918	227,288	79,788	447,890	191,427	1,476,787
	1988	52,772	85,487	268,169	89,656	496,085	261,697	1,873,852
	1987	26,018	81,675	161,790	67,404	336,826	166,473	669,332
	1986	43,656	94,786	243,533	101,683	483,657	196,180	1,201,356
	1985	26,582	74,620	106,447	46,164	253,813	131,765	767,548
	1984	23,035	147,750	211,783	93,481	476,050	338,872	608,685
	1983	5,135	91,492	73,042	20,754	190,423	177,050	218,265
	1982	10,536	84,972	102,390	32,173	230,071	130,252	669,227
16 in.	1991	9,382	99,730	206,120	46,457	361,688	265,446	15,386,310
	1990	63,994	122,186	157,792	76,076	420,048	270,422	1,403,727
	1989	25,288	99,141	145,913	54,092	324,434	236,993	1,615,768
	1988	34,217	114,232	185,798	56,558	390,805	203,181	2,256,422
	1987	34,775	109,042	187,216	68,857	399,890	190,946	13,334,886
	1986	21,474	104,368	183,134	53,546	362,523	302,102	1,071,477
	1985	8,511	80,529	47,708	20,091	156,839	154,746	167,876
	1984	15,106	131,139	111,234	82,747	340,226	231,790	363,718
	1983	31,542	337,088	329,963	278,159	1,576,758	447,890	2,370,748
	1982	6,278	104,319	113,380	21,936	245,913	175,715	30,841
20 in.	1991	17,653	115,470	163,039	71,009	367,171	264,430	13,749,275
	1990	72,042	180,469	210,378	114,252	577,141	428,910	4,943,250
	1989	82,862	202,309	446,538	135,703	867,411	366,853	2,778,664
	1988	27,225	139,302	170,120	58,787	345,225	246,260	2,776,416
	1987	35,655	139,346	172,071	68,265	415,337	274,034	904,487
	1986	29,227	134,332	182,623	82,657	428,839	175,000	1,077,419
	1985	108,870	187,379	190,886	144,974	632,109	353,088	1,277,454
	1984	16,735	175,406	190,088	63,302	445,531	226,415	616,250
	1983	12,682	147,354	154,811	46,073	360,934	237,600	476,104
	1982	12,284	124,148	128,148	30,649	295,229	210,378	482,464
24 in.	1991	19,013	158,756	220,900	55,916	454,596	336,289	4,390,250
	1990	54,631	193,527	277,460	123,844	649,462	237,583	4,894,667
	1989	26,328	165,032	193,096	75,348	469,804	446,819	2,186,435
	1988	49,494	231,264	360,603	145,358	786,719	431,093	14,289,167
	1987	34,785	254,677	271,319	110,959	671,741	405,987	2,043,000
	1986	43,746	245,807	378,917	170,094	838,565	355,428	1,607,660
	1985	26,648	296,486	305,437	151,657	780,228	469,318	4,893,740
	1984	29,133	289,487	298,521	128,390	745,531	395,676	1,772,049
	1983	31,416	310,583	501,401	148,993	995,393	608,781	1,649,454
	1982	28,537	508,226	807,847	120,895	1,465,505	\$	\$
30 in.	1991	31,703	252,331	252,064	173,554	709,652	600,120	4,763,044
	1990	33,430	303,009	226,208	160,097	722,744	531,261	3,298,916
	1989	26,050	294,249	285,222	116,421	721,981	489,867	3,000,000
	1988	47,502	260,549	322,973	137,019	768,043	526,637	14,858,168
	1987	25,506	257,158	308,383	161,008	752,054	477,195	1,584,483
	1986	34,035	268,922	253,838	120,603	677,397	188,835	1,571,948
	1985	60,408	320,219	314,878	152,035	847,541	668,640	5,778,947
	1984	20,885	336,043	376,631	183,034	916,592	637,546	1,413,826
	1983	23,872	253,071	348,478	116,084	741,506	660,086	1,683,143
	1982	20,756	296,737	362,787	93,103	773,383	548,396	1,179,760
36 in.	1991	37,274	366,217	297,010	184,782	885,284	702,140	2,975,614
	1990	28,792	391,256	354,475	149,048	923,571	647,205	2,854,280
	1989	35,408	417,820	529,578	180,613	1,163,419	832,407	2,410,057
	1988	59,395	385,007	449,650	204,591	1,098,643	758,869	2,625,105
	1987	45,461	415,118	637,294	144,784	1,242,657	1,170,963	1,923,266
	1986	360,582	428,572	468,960	151,769	1,085,359	714,286	5,264,368
	1985	21,967	389,751	296,742	157,536	865,997	629,179	6,443,590
	1984	36,063	358,876	362,667	152,787	910,393	665,480	2,143,680
	1983	51,436	498,047	490,568	306,666	1,346,717	703,112	2,724,493
	1982	13,429	375,281	176,287	58,733	623,730	615,160	833,546

*1982 by calendar year. 1983-91 based on FERC construction-permit applications, for 12-month period ending June 30 of that year. \$ One report only. † Involves a river crossing.

Table 7

Current compressor-station costs

Location	Horsepower	Equipment & material	Labor	\$			Total	\$/hp
				Land	Misc.*			
Massachusetts†	1,000	1,760,600	1,745,100	3,700	1,648,682		5,158,082	5,158
North Dakota	1,100	1,705,870	976,490	15,000	556,206		3,253,566	2,958
Oregon†	1,343	1,253,900	619,600	3,400	628,647		2,505,547	1,866
Idaho	1,543	1,179,800	583,200	3,200	445,230		2,211,430	1,647
Washington	1,343	1,388,800	686,400	3,700	677,663		2,756,563	2,053
Idaho	1,343	1,181,600	583,900	3,200	442,330		2,211,030	1,646
Oregon	1,343	1,254,500	619,900	3,400	627,947		2,505,747	1,866
New York†	2,000	409,600	478,100	500	325,100		1,213,300	607
New York†	2,100	4,128,000	2,211,300	4,700	2,855,365		9,199,365	4,381
Colorado	2,700	4,350,000	3,350,000	210,000	4,913,489		12,823,489	4,749
New York†	3,500	3,109,400	1,265,500	3,700	2,045,818		6,424,418	1,836
Oklahoma	4,000	5,746,000	2,557,000	110,000	1,457,672		9,870,672	2,468
New York	4,390	2,887,000	1,051,000	—	964,024		4,902,024	1,117
Washington	4,390	3,133,200	1,548,400	8,400	1,139,840		5,829,840	1,328
Idaho	4,390	2,483,900	1,405,600	7,600	1,042,906		5,300,006	1,207
Wyoming	4,390	2,843,900	1,405,600	7,600	1,042,906		5,300,006	1,207
Utah	4,390	2,788,400	1,378,000	7,500	1,126,106		5,300,006	1,207
Nevada	4,500	2,935,000	915,000	—	317,203		4,167,203	926
New York	4,500	4,851,000	1,543,000	200,000	1,409,311		8,003,311	1,779
Colorado	4,750	2,810,000	527,000	289,000	1,537,936		5,163,936	1,087
Colorado	5,278	2,605,000	983,000	25,000	1,212,482		4,825,482	914
Arizona	5,300	3,376,000	1,605,000	—	2,799,867		7,780,867	1,468
Arizona	5,300	3,695,000	1,797,000	—	2,930,945		8,422,945	1,589
Louisiana	5,485	4,746,900	2,260,900	3,000	3,269,590		10,280,390	1,874
Idaho	5,500	3,478,800	1,719,400	9,200	1,432,594		6,639,994	1,207
Wyoming	5,600	2,493,000	923,000	—	1,342,000		4,758,000	850
Washington	6,500	4,214,100	2,082,800	11,200	1,539,363		7,847,463	1,207
Washington	6,500	4,128,400	2,040,500	11,000	1,667,563		7,847,463	1,207
Illinois	7,200	7,392,000	2,776,000	50,000	2,064,444		12,282,444	1,706
Wyoming	7,200	7,239,500	4,302,400	9,500	2,973,350		14,524,750	2,017
New Mexico	7,950	6,903,200	2,745,400	80,000	4,349,131		14,077,731	1,771
Illinois	8,000	7,815,000	2,776,000	60,000	2,121,470		12,772,470	1,597
Iowa	8,000	8,100,000	2,776,000	60,000	2,159,548		13,095,548	1,637
Louisiana	8,100	9,127,534	2,360,000	30,000	1,848,658		13,366,192	1,650
Texas†	9,030	7,576,000	2,286,000	—	2,252,000		12,114,000	1,346
Oregon	8,780	4,831,900	2,388,000	12,900	1,921,640		9,154,440	1,043
Mississippi	9,570	7,340,800	3,201,700	141,300	4,373,230		15,057,030	1,573
Arkansas	10,000	6,324,000	482,000	—	1,240,000		8,046,000	805
Arkansas	10,000	6,490,000	536,000	40,000	1,300,000		8,366,000	837
Colorado	10,350	8,655,000	2,327,000	2,000	2,937,520		13,921,520	1,345
Colorado	11,000	6,077,100	3,003,300	16,200	2,372,470		11,469,070	1,043
Utah	11,000	6,025,500	2,977,900	16,100	2,449,470		11,468,970	1,043
Washington	11,000	6,694,700	3,308,000	17,900	2,594,841		12,616,241	1,147
Iowa	12,000	7,167,776	3,203,200	514,013	3,118,160		14,003,149	1,167
Texas	12,000	5,837,000	1,657,000	—	3,346,652		10,840,652	903
Arizona	12,000	5,639,000	1,839,000	—	3,359,208		10,837,208	903
New Mexico	12,000	5,709,000	2,098,000	—	3,533,267		11,340,267	945
Pennsylvania	12,000	6,101,400	2,188,600	—	—		8,290,000	658
Oregon	13,000	6,431,900	3,178,900	17,100	2,499,810		12,127,710	933
Idaho	13,000	6,431,900	3,178,900	17,100	2,499,810		12,127,710	933
Illinois	13,800	13,628,000	6,152,000	275,000	4,079,680		24,130,680	1,749
Louisiana	14,355	11,261,100	4,593,100	166,300	6,014,890		22,035,390	1,535
Minnesota†	15,700	8,576,000	1,841,000	—	4,382,012		14,799,012	943
Minnesota†	15,700	8,576,000	1,841,000	—	4,382,012		14,799,012	943
Utah	21,112	10,546,000	3,505,000	25,000	3,677,408		17,753,408	841
Pennsylvania	23,500	12,528,874	5,360,126	20,000	3,677,408		18,138,000	772
Iowa	24,000	14,417,004	6,442,800	1,033,867	6,271,753		28,165,424	1,174
Washington	28,800	11,762,700	5,813,700	31,400	4,265,989		21,873,489	759
Iowa	100,000	59,867,220	26,754,000	4,293,176	26,043,720		116,958,116	1,170
Total—land projects	\$94,995	\$382,371,778	\$156,754,216	\$8,080,856	\$155,846,952		\$703,053,802	1,202
1990—report total land projects	838,335	\$534,290,076	\$245,051,382	\$9,319,477	\$200,327,337		\$988,988,272	1,180
Total—all projects	\$84,995	\$382,371,778	\$156,754,216	\$8,080,856	\$155,846,952		\$703,053,802	1,202
1990—report total all projects	838,335	\$534,290,076	\$245,051,382	\$9,319,477	\$200,327,337		\$988,988,272	1,180

Source: U.S. FERC construction-permit applications, July 1, 1990, to June 30. * Generally includes surveying, engineering, supervision, interest, administration & overheads, contingencies, afudc, and FERC fees. † Additions.

shore, reach \$1.84 billion.

Total costs of projects surveyed in last year's Pipeline Economics Report ran more than \$6 billion divided between \$6.008 billion for land and \$50 million for offshore.

All projects proposed during the period covered (July 1, 1990, to June 30) represent a marked decrease in proposed mileage over the previous 12-month period covered. But several projects in that earlier period, as noted, were refilings, totaling

about 2,100 miles.

Nevertheless, the more than 3,000 miles for the current period surveyed suggests the growing strengths of natural gas in commercial, residential, and power-generation use.

Cost trends, components

Cost-per-mile figures may reveal more about cost trends than aggregate costs.

For proposed U.S. gas-pipeline projects in the 1990-91 period surveyed, the aver-

age land cost per mile was \$593,936 compared with \$830,882/mile for the 1989-90 period, a healthy decrease.

For offshore projects, the 1990-91 figure was \$2,339,865/mile compared with the 1989-90 figure of \$834,057, a substantial increase.

Combined land and offshore projects show an average cost of \$594,442/mile for this year's coverage; for the 1989-90 period, the figure

was \$830,908/mile.

Analyses of the four major categories of pipeline construction costs—material, labor, right-of-way (R.O.W.), and miscellaneous—can also indicate trends within each group.

R.O.W. figures include the cost of obtaining right-of-way and of any allowance for damages.

"Miscellaneous" generally includes surveying, engineering, supervision, contingencies, allowances for funds

Table 8

Natural-gas pipeline transmission expenses*

	Expenses, \$		Cost/mile, \$		Cost/MMcf sold, \$	
	1988- majors†	1989- majors‡	1988- majors†	1989- majors‡	1988- majors†	1989- majors‡
Operation expenses						
Supervision and engineering	166,584,029	176,198,733	661.37	693.53	26.16	31.69
System control and load dispatching	29,284,519	33,213,655	116.26	130.73	4.60	5.97
Communication system expenses	30,224,686	31,600,547	120.00	124.38	4.75	5.68
Compressor station labor and expenses	269,976,844	296,448,577	1,071.86	1,166.85	42.39	53.32
Gas for compressor-station fuel	375,892,286	376,996,680	1,492.36	1,483.90	59.02	67.81
Other fuel and power for compressor stations	65,481,393	54,138,692	259.97	213.09	10.26	9.74
Mains	182,166,091	174,260,381	723.23	685.98	28.60	31.35
Measuring and regulating station expenses	61,872,085	64,760,794	245.64	254.90	9.72	11.05
Transmission and compression of gas by others	936,299,992	854,273,433	3,717.28	3,362.50	147.02	153.66
Other transmission expenses	40,409,766	53,942,932	160.43	212.32	6.35	9.70
Rents	19,796,436	21,199,398	78.60	83.44	3.11	3.81
Total operation expenses	\$2,177,980,127	\$2,137,055,822	\$6,647.00	\$6,411.85	\$341.90	\$384.40
Maintenance expenses						
Supervision and engineering	31,519,887	34,610,110	125.14	136.23	4.95	6.23
Structures and improvements	22,517,885	20,767,763	89.40	81.74	3.54	3.74
Mains	109,462,229	114,999,238	434.58	452.65	17.19	20.69
Compressor-station equipment	218,175,493	251,193,978	866.20	988.72	34.26	45.18
Measuring and regulating station equipment	13,202,645	14,567,775	52.42	57.34	2.07	2.62
Communication equipment	11,906,439	10,414,463	47.27	40.99	1.87	1.87
Other equipment	4,036,815	5,669,129	16.03	22.31	0.63	1.02
Total maintenance expenses	\$410,821,393	\$452,222,456	\$1,631.03	\$1,779.99	\$64.51	\$81.34
Total transmission expenses	\$2,588,801,520	\$2,589,278,278	\$10,278.03	\$10,191.84	\$406.49	\$465.75
Total miles of transmission pipeline	251,878	254,059				
Total natural gas sold, MMcf	6,368,682	5,559,400				

Source: Statistics of Interstate Natural Gas Pipeline Companies—1988 & 1989, U.S. Department of Energy. *U.S. interstate pipelines for calendar years 1988 & 1989, †46 of 135 companies filing Forms 2s or 2As with the U.S. FERC for 1988; majors are companies whose combined gas sold for resale and gas transported or stored for a fee exceeded 50 bcf (at 14.7 psi; 60° F.) in each of the 3 previous calendar years. ‡45 of 144 companies filing Forms 2 or 2A with the U.S. FERC for 1989; majors defined in previous note and in U.S. FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 60).

used during construction (afudc), administration and overheads, and FERC filing fees.

For the 129 projects surveyed for the 1990-91 period covered in this report, cost-per-mile data for the four categories are as follows:

- Material—Land, \$217,348/mile; offshore, \$212,734/mile; combined, \$217,294/mile.
- Labor—Land, \$228,984/mile; offshore, \$306,752/mile; combined, \$229,890/mile.
- R.O.W. and damages—Land, \$25,994/mile; offshore, \$81/mile; combined, \$25,692/mile.
- Miscellaneous—Land, \$121,610/mile; offshore, \$117,765/mile; combined, \$121,565/mile.

Table 2 lists proposed pipelines in order of increasing diameter and increasing lengths within each pipeline diameter. The average cost per mile for the projects shows no clear-cut trend related to either length or geographic area.

In general, however, the cost per mile within a given

diameter indicates that the longer the pipeline, the lower the incremental cost for construction.

Nonetheless, road, highway, and river crossings and marshy or rocky terrain each strongly affects pipeline construction costs.

Fig. 3, derived from Table 2 for land and offshore pipelines, shows the major cost-component split for pipeline construction cost.

Material and labor are shown to make up more than 75% of the cost of constructing land pipelines and more than 81% of the cost for offshore pipelines.

Fig. 4 plots the average pipeline construction cost for land and offshore gas-pipeline construction projects listed in Table 2.

Compressor stations

Compressor-station costs make up another major cost element of natural-gas pipelines. Table 7 lists 59 land compressor-station projects. FERC applications for these projects cover the same period as for pipelines: July 1, 1990, to June 30.

Costs for new land compressor stations range from a low of \$607/hp for a 2,000-hp station in New York to a high of \$5,158/hp for a 1,000-hp station in Massachusetts. Cost-per-horsepower figures show no particular correlation with compressor-station size or location.

Fig. 5 shows the cost split for land compressor stations based on data in Table 7.

Effect of size

Another element affecting the capital expenditures for pipeline construction is the distribution of the diameter and mileage.

As an aid in determining the detailed costs for each major element in pipeline and compressor-station construction for the pipelines and compressor stations, several tables covering specific projects are included in this report (p. 56).

These give detailed cost breakdowns for each major component in a construction-cost estimate. They cover cost information from the FERC applications for the 1990-91 period surveyed and

listed in Table 2.

These detailed tables represent both a variety of land geographic locations in the U.S. and pipeline and compressor stations for both land and offshore facilities.

Operating costs

Once a gas pipeline is laid, compressor stations constructed, meters installed, and operating costs become the next consideration.

As an aid in estimating this element, transmission expenses for interstate gas pipelines for 1988 and 1989, have been included (Table 8). Data for these years are the most recent available in aggregate from the FERC.

Table 8 is based on 251,878 miles of pipeline operated and 6.4 tcf of gas sold for 1988 majors and on 254,059 miles of pipeline operated and 5.6 tcf of gas sold for 1989 majors.

• The highest component of transmission-operating expenses is transmission and compression of gas by others: for majors in 1988, this component was \$3,717/mile or \$147/MMcf; for majors in

A look at various projects

28.4 miles of 20 in., Kansas

Item	Cost
Right-of-way	50,000
Damages	233,000
Surveys	21,000
Materials	3,805,000
Labor	3,299,000
Engineering, inspection	687,000
Line pack	38,000
Pipe coating	272,000
Cathodic protection	14,000
Telecommunication equipment	
Overheads	76,000
Afudc	153,000
Other services, costs	100,740
Regulatory fees (est.)	26,260
Total	\$8,575,000
\$/mile	\$301,937

8 miles of 36-in. loop, Michigan

Item	Cost, \$
Right of way	216,000
Damages	216,000
Surveys	24,000
Materials	2,706,300
Labor	3,395,300
Engineering, inspection	800,000
Line pack	58,600
Taxes	108,300
Freight	270,600
Pipe coating	208,000
Cathodic protection	1,300
Overheads	122,000
Afudc	427,200
Contingencies	305,100
Legal fees	112,000
Regulatory fees	26,260
Total	\$8,996,960
\$/mile	\$1,124,620

Install 4,000 hp, Oklahoma

Item	Cost, \$
Right of way	110,000
Materials	5,746,000
Labor	2,557,000
Engineering, inspection	388,000
Overhead	742,000
Afudc	222,000
Contingencies	100,000
Regulatory fees (est.)	5,762
Total	\$9,870,672
\$/hp	\$2,468

6 miles of 36 in., Pennsylvania

Item	Cost, \$
Right of way	290,000
Damages	57,600
Surveys	47,500
Materials	2,231,800
Labor	3,223,200
Engineering, inspection	362,300
Line pack	45,800
Taxes	176,900
Freight	145,000
Pipe coating	294,800
Overheads	528,900
Afudc	565,242
Contingencies	347,100
Other services, costs	67,100
Regulatory fees (est.)	4,005
Total	\$8,387,247
\$/mile	\$1,397,875

17 miles of 20 in., Washington

Item	Cost, \$
Right of way	20,000
Materials	4,472,000
Labor	
Internal contractor	131,600
General contractor	5,704,200
Engineering, design	
Internal engineering	90,600
Engineering consultant	875,000
Permit application fees	8,000
Travel, business expenses	8,000
Taxes	735,400
Other services, costs	430,000
Regulatory fees (est.)	—
Total	\$13,474,800
\$/mile	\$792,635

62.75 miles of 24 in., Oklahoma

Item	Cost, \$
Right of way	1,039,000
Damages	525,000
Surveys	256,000
Materials	9,370,000
Labor	8,526,000
Engineering, inspection	531,000
Overheads	591,000
Afudc	374,000
Regulatory fees (est.)	14,185
Total	\$21,226,185
\$/mile	\$338,266

3.1 miles of 12-in. loop, Massachusetts

Item	Cost, \$
Right of way & damages	715,000
Materials	
Pipe	395,000
Valves	73,000
Other materials	105,000
Labor	
Contract installation	2,486,000
Company costs	201,000
Other fees, services	212,000
Afudc	79,000
Contingencies	220,000
Legal fees	100,000
Regulatory fees	26,000
Total	\$4,612,000
\$/mile	\$1,487,742

10,350 hp, Colorado

Item	Cost, \$
Land	2,000
Damages	—
Surveys	4,000
Materials	8,650,000
Labor	2,327,000
Engineering, inspection	933,000
Line pack	
Taxes	519,000
Freight	130,000
Pipe coating	5,000
Overheads	349,000
Afudc	978,020
Regulatory fees (est.)	24,500
Total	\$13,921,520
\$/hp	\$1,345

4,500 hp, Nevada

Item	Cost, \$
Land	—
Damages	—
Surveys	5,000
Materials	
Turbine compressor package, piping	2,100,000
Valves, controls	385,000
Labor	450,000
Company	15,000
Contractor	300,000
Other field costs	600,000
Overheads	144,563
Contingencies	154,200
Regulatory fees (est.)	13,440
Total	\$4,167,203
\$/hp	\$926

Add 15,700 hp, Minnesota

Item	Cost, \$
Land	—
Materials	8,576,000
Labor	1,841,000
Engineering, inspection	1,023,000
Line pack	—
Taxes	635,000
Freight	529,000
Telecommunication equipment	100,000
Overheads	200,000
Afudc	895,000
Contingencies	873,000
Legal fees	15,000
Other services, costs	100,000
Regulatory fees	12,012
Total	\$14,799,012
\$/hp	\$943

20.49 miles of 20 in., Wyoming

Item	Cost, \$
Right of way	219,000
Damages	76,000
Surveys	69,000
Materials	2,096,000
Labor	3,043,000
Engineering, inspection	270,000
Line pack	61,000
Taxes	131,000
Freight	235,000
Pipe coating	228,000
Cathodic protection	42,000
Overheads	194,000
Afudc	204,000
Contingencies	48,000
Regulatory fees	1,000
Total	\$6,917,000
\$/mile	\$337,579

1989, this component was \$3,363/mile or \$154/MMcf.

• The second highest cost component of transmission-operating expense is gas for compressor-station fuel: for majors in 1988, \$1,492/mile or \$59/MMcf; for majors in 1989, \$1,484/mile or \$68/MMcf.

• The highest cost component of maintenance expense covers compressor-station equipment: for majors in 1988, \$866/mile or \$34/MMcf; for majors in 1989, \$989/mile or \$45/MMcf.

• The second highest cost component for maintenance is the maintenance of pipelines: for 1988 majors, \$435/mile or \$17/MMcf; for majors in 1989, \$453/mile or \$21/MMcf.

• Table 8 indicates that the highest component of transmission expenses for natural-gas pipelines is the operation expense: for 1988 majors, \$8,647/mile or \$342/MMcf; for 1989 majors, \$8,412/mile or \$384/MMcf.

• Unit-maintenance expenses for 1988 majors were \$1,631/mile or \$64/MMcf; for 1989 majors, \$1,780/mile or \$81/MMcf.

• During 1988, major natural-gas pipeline companies spent slightly more than \$2.178 billion for operation expenses and \$410.8 million on maintenance. Total expenditures by 1988 majors for operation and maintenance expenses reached almost \$2.589 billion.

Total operation expenses for majors in 1989 fell slightly to 2.137 billion, a drop of almost \$31 million (1.4%). This follows a small drop of 2.2% from 1987 to 1988 noted in last year's report.

Total maintenance expenses in 1989 rose to slightly more than \$452 million from a 1988 cost of \$410.8 million, a marked rise of more than 10%.

Total transmission expenses showed a slight rise between 1988 and 1989. In the latter year, they reached \$2.589 billion.

• On a unit basis, the total 1988 transmission expense for majors was \$10,278/mile or \$407/MMcf of gas sold; for 1987 majors, it was \$10,457/mile or \$402/MMcf.

LIQUID PIPELINES

COMPANY	Miles of pipeline			Deliveries, 1,000 bbl			Total trunkline traffic, million bbl-miles			Fiscal data, \$1,000		
	Gathering	Crude	Products	Total	Crude	Products	Total	Crude	Products	Carrier property	Change	Operating revenue
Adobe Offshore Pipeline Co. (new)	—	—	5	5	—	1,539	1,539	—	8	353	—	278
Airforce Pipeline Inc.	19	51	—	70	344	—	344	17	—	1,970	-162	290
Algonquin Pipeline Co.	—	1,108	—	1,108	38,326	—	38,326	42,466	—	1,540,518	61,672	43,789
All American Pipeline Co.	—	—	603	603	—	—	—	—	—	18,335	—	—
Allegheny Pipeline Co.	—	—	—	—	9,732	—	9,732	7,635	—	152,506	2,263	35,605
Amara Hess Pipeline Co.	—	—	—	—	35,240	—	35,240	2,548	—	36,614	4,125	14,993
American Petroleum Pipeline Co.	—	—	—	—	480,603	—	480,603	110,657	—	649,939	36,226	199,822
Amoco Pipeline Co.	2,227	7,640	2,298	12,165	331,928	148,675	10,384	901	2	901	—	2,866
Antelope Pipeline Co.	—	86	—	86	10,384	—	10,384	901	—	2	—	—
ARCOC Pipeline Co.	1,625	2,867	—	4,492	409,032	108,092	517,124	137,445	9,358	146,803	65,957	630,025
ARCO Pipeline Co.	502	787	—	1,289	102,709	—	102,709	67,708	—	115,220	12,824	206,320
Ashland Pipeline Co.	—	929	—	941	47,373	—	47,373	6,638	—	72,252	7,058	33,581
Atlantic Pipeline Co.	—	27	—	27	—	185	—	—	5	225	—	30
Atco NGL Pipeline Co.	—	—	—	—	—	69,979	—	—	—	26,172	706	12,510
Baldwin Pipeline Co.	—	—	—	—	—	26,733	—	—	—	59,629	965	13,536
Belle Fourche Pipeline Co.	1,282	729	—	2,011	26,733	—	26,733	2,736	523	10,635	74	2,022
Black Lake Pipeline Co.	—	—	—	—	185,447	—	185,447	45,127	—	11,727	2,272	77,772
BP Oil Pipeline Co.	1,019	537	—	1,556	338,877	—	338,877	258,190	11,017	4,999,224	75,590	1,297,888
BP Pipeline (Alaska) Inc.	—	—	—	—	—	—	—	—	—	176	—	55
Buccaneer Pipeline Co.	—	—	—	—	—	—	—	—	—	473,545	-939	138,390
Buckeye Pipeline Co. L.P.	—	—	—	—	—	279,158	—	—	35,170	473,545	-279	3,890
Buckeye Pipeline Co. of Mich. L.P.	—	—	—	—	—	6,394	—	—	166	41,335	193	8,744
Butte Pipeline Co.	—	—	—	—	30,254	—	30,254	6,720	—	98,005	—	—
Calvey Pipeline Co.	—	—	—	—	—	—	—	—	—	99,295	1,335	26,854
Chaparral Pipeline (NGL) Co.	—	—	—	—	—	46,510	—	—	—	38,629	—	7,049
Chase Transportation Co.	2,014	716	—	2,730	588,270	12,217	4,015	69,867	44,994	631,976	14,531	215,205
Chevron Pipeline Co.	—	—	—	—	346,780	—	346,780	24,873	—	36,740	2,670	15,265
Chicago Pipeline Co.	—	235	—	235	104,830	—	104,830	17,135	—	19,646	3	3,202
Chisholm Pipeline Co.	—	203	—	203	7,667	—	7,667	1,457	—	45,122	3,963	15,748
Citgo Pipeline Co.	607	682	—	1,302	106,061	6,222	114,283	2,698	13	4,757	—	—
CNB Petroleum Inc.	—	—	—	—	—	—	—	—	—	3,769	106	345
Clarco Pipeline Co.	90	—	—	90	1,279	—	1,279	—	—	1,445	134	134
Clark Pipeline Co. (new)	—	—	—	—	24,075	—	24,075	—	—	4,549	39	1,542
CNG Pipeline Co.	—	—	—	—	—	—	—	—	—	6,622	8	2,877
Coastal Pipeline Co.	—	—	—	—	—	—	—	—	—	241,353	459	48,887
Cochin Pipeline System	—	1,197	—	1,197	15,533	—	15,533	23,087	1,108	1,368,551	14,815	527,136
Collins Pipeline Co.	—	124	—	124	26,269	—	26,269	5,514	—	16,443	712	1,238
Colonial Pipeline Co.	—	5,274	—	5,274	665,269	—	665,269	691,391	5,514	1,388,551	14,815	527,136
Conoco Pipeline Co.	—	—	—	—	197,081	—	197,081	14,757	9,770	240,932	3,730	81,437
Conoco Pipeline Co.	3,710	1,854	2,155	7,519	255,236	58,155	255,236	—	—	—	—	—

LIQUID PIPELINES (continued)

COMPANY	Miles of pipeline			Deliveries, 1,000 bbl			Total trunkline traffic, million bbl-miles			Fiscal data, \$1,000		
	Gathering	Crude	Products	Total	Crude	Products	Total	Crude	Products	Carrier property	Change	Operating revenue
Conquest Transmission Co.	—	—	—	—	—	—	—	—	—	150	—	—
Cook Inlet Pipe Line Co.	—	55	—	55	6,921	—	6,921	207	—	62,535	20,018	4,874
Crown-Ranch Pipe Line Corp.	—	—	—	—	7,155	—	7,155	2,284	—	21,181	26	1,865
Cushing Lemont Pipeline Co.	—	26	—	26	6,297	—	6,297	2,240	—	21,053	140	2,176
CXY Offshore Systems Inc.	—	—	—	—	54	—	54	5	—	1,667	—	88
Diamond Shamrock	—	—	—	—	—	—	—	—	—	—	—	—
Refining and Marketing Co.	—	—	—	—	—	—	—	—	—	—	—	—
Dixie Pipeline Co.	—	—	—	—	—	—	—	—	—	—	—	—
Dome Pipeline Corp.	—	—	—	—	—	—	—	—	—	—	—	—
Emerald Pipe Line Corp.	1	8	—	134	134	—	134	237	—	22,831	66	2,942
Endicott Pipeline Co.	—	—	—	—	—	—	—	—	—	1,430	—	702
Enron Liquids Pipeline Co.	—	25	—	113	113	—	113	964	—	55,867	210	27,407
Enterprise Pipeline Co.	—	—	—	—	—	—	—	—	—	189,263	5,072	35,448
EPC Partners Ltd.	—	—	—	—	—	—	—	—	—	20,436	—	3,088
Eureka Pipe Line Co.	766	3	—	772	1,586	—	1,586	1	—	48,340	—	3,437
Ewing Bank Pipeline Co.	—	—	—	—	—	—	—	—	—	15,994	—	6,140
Explorer Pipeline Co.	—	—	—	—	—	—	—	—	—	1,772	—	797
Exxon Pipeline Co.	—	—	—	—	—	—	—	—	—	7,685	—	1,138
Farmiland Industries Inc.	1,832	—	—	1,397	1,397	—	1,397	58	—	260,559	1,513	91,602
Forest Pipeline Co. (new)	618	239	—	857	400,500	—	400,500	142,187	—	2,249,871	36,522	614,295
Four Corners Pipe Line Co.	274	12	—	286	20,204	—	20,204	725	—	13,439	1,470	4,306
Frontier Pipeline Co.	—	—	—	—	—	—	—	—	—	3	1,978	206
Giant Industries Arizona	—	—	—	—	—	—	—	—	—	10,148	9,843	41,581
Formerly Cimza Pipeline	176	135	—	322	6,588	—	6,588	51	—	49,113	263	426
Gulf Central Pipeline Co.	—	—	—	—	—	—	—	—	—	6,657	—	2,743
Harbert Oil & Gas Corp. (new)	—	—	—	—	—	—	—	—	—	70,736	—	—
Heartland Pipeline Co. (new)	—	—	—	—	—	—	—	—	—	—	—	—
Hess Pipeline Co.	—	—	—	—	—	—	—	—	—	10,106	10,106	543
Howell Crude Oil Co.	—	—	—	—	—	—	—	—	—	53,179	5,958	12,412
Interstate Storage & Pipeline Co.	—	—	—	—	—	—	—	—	—	2,180	—	87
Jayhawk Pipeline Corp.	784	6	—	790	29,654	—	29,654	2,261	—	3,218	—	1,645
Joliet Pipe Line Co.	29	—	—	29	608	—	608	—	—	29,830	2,846	12,997
Kaneb Pipe Line	—	—	—	—	—	—	—	—	—	11,937	94	3,489
Operating Partnership L.P.	—	—	—	—	—	—	—	—	—	—	—	—
Kernal Pipe Line Co. (new)	23	—	—	23	30,637	—	30,637	52	—	112,344	2,387	37,618
Kerr-McGee Pipeline Corp.	8	—	—	8	1,148	—	1,148	31	—	12,967	3	6,836
Kirtland Pipeline Corp.	—	—	—	—	—	—	—	—	—	7,113	6	2,334
Koch Pipelines Inc.	914	78	—	992	20,735	—	20,735	1,622	—	10,369	22	4,354
Kuparuk Transportation Co.	—	—	—	—	—	—	—	—	—	313,806	14,374	69,470
Lake Charles Pipe Line Co.	—	—	—	—	—	—	—	—	—	127,144	—	18,143
Lakehead Pipe Line Co. Inc.	—	—	—	—	—	—	—	—	—	11,123	71	4,204
Largo Co. The	—	—	—	—	—	—	—	—	—	572,547	25,002	205,672
Laurel Pipe Line Co.	—	—	—	—	—	—	—	—	—	12,681	27	1,779
Locap Inc.	—	—	—	—	—	—	—	—	—	46,781	—	15,298
Mapco Ammonia Pipeline Inc.	—	—	—	—	—	—	—	—	—	120,668	146	19,769
Marathon Pipe Line Co.	1,218	1,716	—	4,403	373,663	—	373,663	12	—	37,646	—	—
McMoran Pipeline Co.	—	—	—	—	—	—	—	—	—	2,800	5,293	158,661
Mendota Oil Frontiers Inc.	—	—	—	—	—	—	—	—	—	3,174	—	361
Mesa Transmission Co.	—	—	—	—	—	—	—	—	—	7,170	—	381
Mid-America Pipeline Co.	—	—	—	—	—	—	—	—	—	2,800	—	—
Mid-Valley Pipe Line Co.	—	—	—	—	—	—	—	—	—	354	—	34
Midland-Lea Inc.	—	—	—	—	—	—	—	—	—	10,512	58	517
Minnesota Pipe Line Co.	—	—	—	—	—	—	—	—	—	455,694	5,225	145,746
Mine Point Pipe Line Co.	—	—	—	—	—	—	—	—	—	102,815	1,293	45,125
Minnesota Pipe Line Co.	—	—	—	—	—	—	—	—	—	23,239	943	519
Mico Pipeline Co.	—	—	—	—	—	—	—	—	—	26,975	94	9,756
Mobil Pipeline Co.	—	—	—	—	—	—	—	—	—	112,463	8,006	27,207
Mobil Pipeline Co.	—	—	—	—	—	—	—	—	—	2,105	—	18
Mobil Pipeline Co.	—	—	—	—	—	—	—	—	—	406,403	6,185	103,671

LIQUID PIPELINES (continued)

COMPANY	Miles of pipeline			Deliveries, 1,000 bbl			Total trunkline traffic, million bbl-miles			Fiscal data, \$1,000		
	Gathering	Trunk	Products	Total	Crude	Products	Total	Crude	Products	Carrier property	Change	Operating revenue
Mobil Eugene Island Pipeline Co.	—	134	—	134	24,421	—	24,421	1,523	—	47,207	152	21,241
Mobil Pipe Line Co.	3,282	4,641	—	9,647	211,797	100,017	311,814	61,199	11,536	327,032	4,938	158,476
National Transit Co.	—	—	—	—	210	—	210	—	—	3	—	606
Navejo Pipeline Co.	—	70	323	393	5,444	5,444	5,444	—	1,148	11,481	551	5,694
Northern Rockies Pipe Line Co.	—	77	—	77	286	—	286	22	—	1,049	—	98
NW Pipeline Co.	—	—	—	—	1,961	—	1,961	237	—	6,438	48	2,204
Ohio Oil Gathering Corp.	157	—	—	157	4,028	—	4,028	—	—	11,414	231	7,556
Ohio River Pipe Line Co.	—	400	—	400	15,530	—	15,530	—	1,795	29,246	3,248	7,859
Oiltanking Pipeline Inc.	—	16	—	16	57,641	—	57,641	719	3	16,758	885	5,954
Olympic Pipe Line Co.	—	373	—	373	97,290	97,290	97,290	—	17,502	61,553	958	29,271
Osage Pipe Line Co.	—	136	—	136	38,455	—	38,455	5,213	—	19,736	210	7,721
Owensboro-Ashtand Co.	—	266	—	266	71,690	—	71,690	19,033	—	45,779	1,339	12,006
Oxy NGL Pipeline Co.	—	106	—	106	6,010	—	6,010	637	—	3,984	281	1,418
Oxy Pipeline Inc.	—	—	—	—	1,008	—	1,008	34	—	3,905	—	665
Paloma Pipe Line Co.	—	—	—	—	27,689	—	27,689	1,381	—	5,871	28	2,468
Pennzoil Offshore Pipeline Co.	—	4	—	4	279	—	279	8	—	4,025	—	262
Pennzoil Operating L.P. dba Western Oil Transportation	573	—	—	573	11,704	—	11,704	—	—	31,241	206	6,184
Phillips Alaska Pipeline Corp.	—	818	—	818	9,277	—	9,277	6,909	—	129,569	2,057	33,533
Phillips Pipe Line Co.	1,044	819	—	1,863	59,220	189,869	249,089	12,894	40,668	476,366	62,917	149,385
Pioneer Pipe Line Co.	—	299	—	299	5,473	—	5,473	—	1,315	14,197	96	2,896
Plantation Pipe Line Co.	—	3,160	—	3,160	177,778	—	177,778	—	110,305	315,865	5,268	111,626
Plantex Pipeline Co.	—	27	—	27	311	—	311	8	—	2,590	69	421
Platte Pipe Line Co.	—	1,282	—	1,282	41,533	—	41,533	22,268	80,635	1,338	415	22,885
Pogo Offshore Pipeline Co.	—	—	—	—	119	—	119	4	—	—	6	216
Point Arguello Pipeline Co. (new)	—	—	—	—	5,981	—	5,981	138	—	52,704	704	21,242
Point Pedernales Pipeline Co.	—	46	—	46	20,797	—	20,797	7,262	—	48,109	3,316	13,166
Portland Pipe Line Co.	338	615	—	953	39,619	—	39,619	6,488	—	42,470	348	23,594
Portland Pipe Line Corp.	—	177	—	177	1,845	—	1,845	123	—	11,168	83	1,240
Razorback Pipeline Co. (new)	—	—	—	—	104	—	104	—	—	1,880	—	148
Roughrider Pipeline	48	—	—	48	—	—	—	—	—	10,237	3,080	2,059
Samdan Pipeline Corp. (new)	2	—	—	2	50	—	50	—	—	351	—	—
Scana Hydrocarbons Inc.	—	62	—	62	53,403	—	53,403	—	25,604	204,337	—275	33,921
Seminole Pipeline Co.	106	634	—	740	73,076	—	73,076	3,838	3,445	41,330	534	19,015
Shamrock Pipe Line Corp.	549	418	—	967	46,957	—	46,957	94,688	7,835	496,222	13,161	191,071
Shell Pipe Line Corp.	2,050	434	—	2,484	427,202	136,057	563,259	8	—	5,842	799	21,240
Sonata Oil Transmission Inc.	—	56	—	56	755	—	755	8	—	44,298	15,162	157,622
Southcap Pipe Line Co.	—	—	—	—	71,750	—	71,750	39,872	44,298	52,784	—	3,915
SFPPLP	—	3,294	—	3,294	296,805	—	296,805	2,186	—	669	—	3,915
Sun Oil Line Co. of Michigan	—	204	—	204	13,600	—	13,600	2,712	12,194	160,103	1,329	67,186
Sun Pipe Line Co.	384	380	—	764	47,070	—	47,070	67,382	500,831	10,996	10,996	123,331
TE Products Pipeline Co. L.P. (New)	—	4,109	—	4,109	18,437	—	18,437	988	—	15,295	16	3,731
Tecumseh Pipe Line Co.	—	207	—	207	411,264	—	411,264	70,779	16,602	486,840	23,265	139,668
Texaco Pipeline Inc.	1,925	3,223	—	5,148	25,972	—	25,972	—	13,589	319,473	613	22,220
Texas Eastern Products Pipeline Co. (final)	—	—	—	—	78,175	—	78,175	10,520	—	95,570	4,642	29,966
Texas-New Mexico Pipe Line Co.	1,690	2,175	—	3,865	70,086	—	70,086	10,427	1,513	64,018	7,114	13,497
Total Pipeline Corp.	193	635	—	828	17,335	—	17,335	95	—	7,825	724	714
Trans Mountain Oil Pipeline Corp.	—	64	—	64	1,981	—	1,981	—	—	—	—	—
Trans-Oil Pipeline Co. (final)	—	—	—	—	487	—	487	—	—	3,306	35	217
Transco Terminal Co.	—	—	—	—	28	—	28	—	—	—	—	—
UMC (new)	—	—	—	—	53,912	—	53,912	10,206	39	193,755	2,225	46,154
Unocal Pipeline Co.	236	1,446	—	1,682	2,976	—	2,976	782	782	9,034	2,820	1,634
West Emerald Pipeline Corp.	—	427	—	427	64,772	—	64,772	—	7,720	36,282	442	17,231
West Shore Pipe Line Co.	—	—	—	—	—	—	—	—	—	—	—	—

LIQUID PIPELINES (continued)

COMPANY	Miles of pipeline		Deliveries, 1,000 bbl		Total		Total		Total		Total		Fiscal data, \$1,000	
	Gathering	Trunk	Crude	Products	Crude	Products	Crude	Products	Crude	Products	Crude	Products	Change	Operating revenue
West Texas Gulf Pipe Line Co.	—	579	—	—	120,005	—	48,929	—	48,929	—	50,379	—	2,378	30,077
Whiskey Springs Oil Pipeline Co.	—	—	—	—	797	—	797	—	797	—	650	—	—	234
White Shoal Pipeline Corp.	7	—	—	—	3,343	—	3,343	—	3,343	—	85	—	20	194
Williams Pipe Line Co.	7	—	—	—	6,674	168,304	1,892	171,450	1,892	49,358	51,250	—	14,405	138,143
Wolverine Pipe Line Co.	—	—	—	—	621	92,233	—	92,233	—	12,911	73,745	—	402	29,929
Wyco Pipe Line Co.	—	—	—	—	677	20,217	—	20,217	—	3,607	32,923	—	2,625	14,665
Yellowstone Pipe Line Co.	—	—	—	—	753	25,151	—	25,151	—	8,667	32,041	—	484	15,962
1990 Totals	32,349	55,504	80,511	—	168,364	6,562,462	4,815,951	11,378,413	1,890,803	1,508,928	3,499,731	—	\$676,080	\$7,148,541
1988 Totals	33,349	55,684	79,624	—	168,637	6,434,559	4,846,481	11,281,040	1,917,872	1,586,789	3,504,661	—	\$508,984	\$6,511,997

Source: U.S. FERC Form No. 6, Annual Report of Oil Pipelines, Dec. 31, 1990.
* Mileage represents Trans-Alaska Pipeline and is included in total only once to avoid duplication.

GAS PIPELINES

Company	Miles of pipeline		Total compressor stations		Total		Total		Total		Total		Fiscal data, \$1,000	
	Transmission	Field	Storage	Other	Transmission	Other	Transmission	Other	Transmission	Other	Transmission	Other	Additions	Operating revenues
Alabama-Tennessee Natural Gas Co.	288	—	—	—	2	—	2	—	2	—	18,272	—	312	31,815
Algonquin Gas Transmission Co.*	994	—	—	—	5	—	5	—	5	—	407,003	—	34,512	467,159
Algonquin LNG Inc.	—	—	—	—	—	—	—	—	—	—	22,016	—	54	3,971
American Distribution Co.	38	—	—	—	—	—	—	—	—	—	4,766	—	—	—
AMR Pipeline Co.*	9,714	2,212	196	—	46	—	136,187	—	1,093,261	—	2,672,459	—	127,916	1,032,759
ANR Storage Co.	—	24	—	—	—	—	—	—	—	—	127,445	—	8,957	31,085
Arkansas Oklahoma Gas Corp.	364	185	—	—	5	—	12,308	—	10,854	—	69,673	—	5,305	43,602
Arkansas Western Gas Co.	1,326	371	—	—	5	—	26,500	—	6,532	—	150,125	—	9,357	108,911
Avila Inc.*	6,625	3,477	67	—	81	—	244,416	—	494,259	—	2,877,024	—	836,432	1,357,945
Bayou Interstate Pipeline System	—	2	—	—	—	—	2,336	—	—	—	42	—	—	4,633
Boar Creek Storage Co.	—	25	—	—	—	—	—	—	—	—	143,780	—	55	36,148
Black Marlin Pipeline Co.	106	—	—	—	—	—	—	—	—	—	46,550	—	24,326	6,718
Blue Dolphin Pipe Line Co.	49	—	—	—	—	—	—	—	—	—	7,670	—	—	541
Bluefield Gas Co.	32	—	—	—	—	—	—	—	—	—	2,810	—	359	4,516
Boundary Gas Inc.	—	—	—	—	—	—	—	—	—	—	—	—	—	90,321
Canyon Creek Compression Co.	1	—	—	—	1	—	29,781	—	—	—	22,204	—	—	1,392
Caprock Pipeline Co.	18	38	—	—	2	—	19,198	—	21,264	—	4,409	—	4	70,364
Carrigie Natural Gas Co.	221	870	—	—	7	—	6,757	—	3,018	—	81,802	—	3,316	18,531
Centra Pipeline Min. Inc.	66	—	—	—	—	—	—	—	4,602	—	3,602	—	2	18,531
Chandeleur Pipe Line Co.	174	—	—	—	—	—	—	—	27,174	—	21,042	—	173	1,395
CNG Transmission Corp.*	3,793	4,119	519	—	66	—	167,566	—	335,043	—	1,506,198	—	114,362	1,066,759
Colorado Interstate Gas Co.*	3,046	3,034	59	—	27	—	99,215	—	369,948	—	739,186	—	20,636	429,530
Columbia Gas Transmission Corp.*	11,125	6,590	1,213	—	117	—	103,859	—	790,085	—	2,349,210	—	259,428	750,431
Columbia Gulf Transmission Co.*	4,286	—	—	—	13	—	4,286	—	1,110,743	—	1,097,460	—	42,254	144,575
Columbia LNG Corp.	88	—	—	—	—	—	—	—	9,320	—	201,948	—	—	414
Consolidated System LNG Co.	—	—	—	—	—	—	—	—	—	—	—	—	—	20,292
CP National Corp.	—	—	—	—	—	—	—	—	—	—	82,483	—	5,555	42,909
Distrigas of Mass. Corp.	—	—	—	—	—	—	—	—	—	—	53,613	—	3,003	174,475
East Tennessee Natural Gas Co.*	1,121	—	—	—	17	—	81,511	—	51	—	186,742	—	34,633	244,871
Eastern Natural Gas Co.	—	—	—	—	—	—	—	—	—	—	5,162	—	96	5,417
Eastern Shore Natural Gas Co.	—	—	—	—	—	—	—	—	2,687	—	20,122	—	3,240	28,197
El Paso Natural Gas Co.*	10,589	9,675	18	—	86	—	112,274	—	1,249,408	—	2,518,021	—	130,124	1,221,515
Enserch Corp.	8,040	2,280	—	—	47	—	179,199	—	302,261	—	1,297,759	—	57,586	981,451
Equitrans Inc.*	528	1,487	135	—	6	—	49,138	—	37,563	—	208,476	—	8,470	203,221
Florida Gas Transmission Co.*	4,427	—	—	—	41	—	207,794	—	107,706	—	586,105	—	14,370	587,917
Freeport Interstate Pipeline Co.	—	—	—	—	—	—	—	—	—	—	—	—	—	—

GAS PIPELINES (continued)

Company	Transmission	Miles of pipeline Field	Storage	Total	Transmission	Total compressor stations	Other	Total	Sold	Volumes, MMcf — Trans. for others	Gas plant	Fiscal data, \$1,000 — Additions	Operating revenues	Net income
Gas Gathering Corp.	—	31	—	31	—	—	—	—	—	—	1,606	—	—	—
Gas Transport Inc.	40	68	—	108	—	—	—	—	2,308	—	3,862	—	6,848	19
Gaswell Pipeline System Inc.	155	—	—	155	—	—	—	—	—	10,195	14,064	145	2,014	1,879
Glacier Gas Co.	34	3	—	37	1	—	—	1	279	—	2,349	9	392	23
Granite State Gas Transmission Inc.	105	—	—	105	1	—	—	1	42,255	491	10,780	501	144,951	689
Great Lakes Gas Transmission Co.	1,495	—	—	1,495	14	—	—	14	24,021	527,612	786,472	234,101	227,757	30,690
Great Plains Natural Co.	65	—	—	65	—	—	—	—	4,861	—	16,395	726	17,666	723
Greely Gas Co.	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Green Canyon Pipeline Co. (new)*	67	—	—	67	—	—	—	—	—	41,505	41,313	41,313	3,609	950
Hampshire Gas Co.	203	18	—	18	1	1	—	1	—	—	9,053	81	2,403	624
High Island Offshore System *	11	—	—	203	1	—	—	1	—	436,113	365,350	1,376	43,841	9,015
Honeywell Storage Co.	21	19	—	30	—	—	—	—	468	—	8,785	—	—	—
Indiana Utilities Corp.	116	—	—	31	—	—	—	—	1,331	—	2,554	114	2,014	167
Inland Gas Co.	—	361	—	479	5	—	—	5	—	4,240	23,061	712	8,009	275
Interstate Power Co.	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Iowa-Illinois Gas and Electric Co.	27	—	—	27	—	—	—	—	4,526	—	212,315	10,754	195,593	55,490
Jupiter Energy Corp.	9,298	—	—	102	—	—	—	—	—	14,136	2,441	—	—	158
Kentucky West Virginia Gas Co.	125	2,522	25	12,245	30	72	—	102	76,688	64,746	484,829	28,724	337,706	44,620
Louisiana-Nevada Transit Co.	17	2,084	—	2,209	26	3	—	29	4,349	25,911	87,224	5,539	121,163	60,528
Michigan Consolidated Gas Co.	2,298	—	—	78	—	—	—	—	4,877	1,235	3,119	251	10,294	242
Michigan Gas Storage Co.	545	106	112	2,476	61	8	—	69	166,016	133,284	1,649,640	90,985	1,018,367	31,709
Mid Louisiana Gas Co.	413	148	—	693	1	—	—	1	8,844	233,245	55,520	1,020	10,783	4,465
Midwestern Gas Transmission Co.	354	481	—	894	7	—	—	7	17,066	14,825	95,522	4,360	492,278	7,794
MIGC Inc.	204	28	79	232	3	2	—	5	49,866	97,640	97,640	1,550	163,248	8,071
Miss. River Transmission Corp.	2,018	65	—	2,162	15	—	—	15	228	15,647	15,512	40	4,825	1,236
Mitco Pipeline Co.	—	9	—	9	—	—	—	—	92,093	81,314	459,411	10,462	317,471	13,477
Morone Pipeline Co. (new)*	16	—	—	16	—	—	—	—	295	2,105	7,429	10	501	76
National Fuel Gas Distribution Corp.	578	318	—	896	—	—	—	—	146,204	18,146	813,636	42,380	712,597	547
Natural Gas Pipeline of America *	1,370	—	—	2,802	13	3	—	16	119,126	37,187	813,636	42,380	712,597	547
Natural Gas Pipeline of America *	39	3	—	42	—	—	—	—	99,724	99,724	352,372	22,645	486,543	24,764
Natural Gas Pipeline of America *	10,931	1,798	294	13,023	60	20	—	80	3,425	1,357,198	2,601,755	158,060	1,556,028	19,646
Nora Transmission Co. (new)	16	—	—	16	—	—	—	—	286,008	6,848	1,695	—	—	96
North Penn Gas Co.	566	253	—	819	—	—	—	—	—	—	50,970	—	—	1
Northern Border Pipeline Co.	824	—	—	824	2	—	—	2	—	398,310	1,296,518	1,016	136,399	—
Northern Indiana Public Service Co.	1,336	—	38	1,374	2	2	—	4	107,513	133,950	940,811	42,816	625,159	54,022
Northwest Alaskan Pipeline Co.	16,255	—	210	16,465	99	6	—	105	273,612	1,308,305	2,261,747	39,831	1,152,308	140,099
Northwest Pipeline Corp.	3,563	3,395	7	6,965	40	17	—	57	342,223	730,438	1,196,384	39,686	549,410	103,764
Ohio River Pipeline Corp.	24	—	—	24	—	—	—	—	40,952	2,191	3,685	—	392,572	59,750
Oklahoma-Arkansas Pipeline Co. (new)	—	—	—	—	—	—	—	—	5,161	—	—	—	17,792	170
Orange & Rockland Utilities Inc.	89	—	—	89	—	—	—	—	20,092	—	153,541	13,084	501,018	49,839
Overbrook Pipeline Co.	799	42	—	841	13	—	—	13	—	48,187	63,042	342	8,967	1,631
Pacific Gas Transmission System	—	—	—	—	—	—	—	—	371,598	32,963	146,850	22,651	913,057	21,367
Pacific Interstate Offshore Co.	351	—	—	351	2	—	—	2	14,842	128,685	441,327	41,907	24,211	942
Pacific Interstate Transmission Co.	770	—	—	770	4	—	—	4	79,853	—	12,014	126	246,300	1,777
Pacific Offshore Pipeline Co.	—	—	—	—	—	—	—	—	8,771	—	63,171	2,776	65,861	4,344
Panhandle Eastern Pipe Line Co. *	6,822	5,729	130	12,481	68	57	—	125	13,046	24,411	59,325	2,527	54,360	2,370
Panhandle Interstate Gas System	85	—	—	85	—	—	—	—	77,992	730,345	1,531,112	31,431	597,881	19,950
Penn-Jersey Pipe Line Co.	4	—	—	4	—	—	—	—	29,660	570	11,064	2	1,067	223
Penn-York Energy Corp.	—	—	39	39	—	—	—	—	—	—	—	—	—	—
Pennsylvania & Southern Gas Co.	—	—	—	—	—	2	—	2	—	—	60,474	289	33,054	5,261
Phillips Gas Pipeline Co.	164	—	—	164	—	—	—	—	4,526	1,702	23,720	2,853	23,677	230
Point Arguello Natural Gas Line (new)....	—	—	—	—	—	—	—	—	9	15,803	48,727	183	6,220	265

GAS PIPELINES (continued)

Company	Miles of pipeline		Total		Total compressor stations		Volumes, MMcf		Fiscal data, \$1,000		Net income	
	Transmission	Field Storage	Storage	Total	Transmission	Other	Sold	Trans. for others	Gas plant	Additions		Operating revenues
Questar Pipeline Co. *	1,665	720	50	2,435	11	28	47,058	159,912	406,600	33,622	233,243	22,193
Raton Gas Transmission Co. Inc.	21	—	—	21	—	—	—	—	535	—	3,256	80
Ringwood Gathering Co.	43	273	—	316	—	2	2,623	8,722	10,905	76	7,694	293
Riverside Pipeline Co. L.P. (new)	—	—	—	—	—	—	—	—	—	—	—	—
Sabine Pipe Line Co.	193	—	—	193	2	—	—	33,030	47,509	2,332	7,713	408
San Diego Gas & Electric Co.	133	2	—	133	1	1	3	7,074	541,579	41,440	460,481	207,841
Sea Robin Pipeline Co. *	416	—	—	416	2	1	—	241,348	253,446	578	43,266	17,824
Seagull Interstate Corp.	11	1	—	12	—	—	—	9,338	6,234	—	540	—212
Shenandoah Gas Co.	—	—	—	—	—	—	—	—	—	—	—	—
South County Gas Co.	—	—	—	—	—	—	—	—	3,660	—	—	—
South Georgia Natural Gas Co.	767	—	—	767	2	—	2,729	21,761	24,313	817	26,343	733
South Penn Gas Co.	17	—	—	17	—	—	280	—	726	16	1,022	—17
Southeastern Natural Gas Co. of Ohio	—	—	—	—	—	—	13	—	5	—	482	—98
Southern Energy Co. (LNG)	—	—	—	—	—	—	—	—	155,502	282	11,013	1,616
Southern Natural Co.	7,637	111	48	7,796	50	66	109,640	415,095	1,403,084	73,508	690,240	67,618
Southwest Gas Storage Co.	—	—	31	31	1	—	—	—	69,016	14	10,967	1,792
Southwest Gas Transmission Co.	—	8	—	8	—	—	830	17,830	1,539	266	3,494	10,215
St. Joseph Light & Power	28	—	—	28	—	—	—	222	4,917	—	—	—
Stingray Pipeline Co. *	274	—	—	274	2	—	—	323,386	247,35	607	45,692	10,158
Superior Offshore Pipeline Co.	130	—	—	130	—	—	—	52,473	18,102	3,406	1,604	22
Tarpon Transmission Co.	40	—	—	40	—	—	—	17,436	21,094	2	8,579	6,032
T.C.P. Gathering Co.	—	20	—	20	—	—	—	1,009	1,163	—	113	—193
Tennessee Gas Pipeline Co. *	14,481	31	2	14,514	69	1	144,609	1,528,144	3,886,133	202,715	1,265,743	858,655
Texas Eastern Transmission Corp. *	9,847	48	196	10,091	67	17	363,863	677,304	3,677,881	269,710	1,571,751	64,029
Texas Gas Pipe Line Corp.	6	—	—	6	—	—	1,644	184	439	—	3,660	—78
Texas Gas Transmission Corp. *	5,861	39	225	6,125	28	9	158,356	544,387	1,060,867	67,480	668,033	50,809
Texas Sea Rim Pipeline Inc.	29	—	—	29	—	—	—	1,944	15,565	23	202	—728
Trailblazer Pipeline Co. *	436	—	—	436	—	—	—	76,730	269,254	73	31,384	4,370
Transcontinental Gas Pipe Line Corp. *	10,583	133	117	10,833	40	34	272,620	1,693,084	3,678,705	233,858	1,260,517	32,326
Transwestern Pipeline Co. *	4,482	—	—	4,482	76	—	38,176	275,022	714,414	17,691	3,281,971	48,549
Trunkline Gas Co. *	4,198	530	27	4,755	20	9	102,030	475,926	1,109,443	115,074	479,682	12,456
Trunkline LNG Co.	—	—	—	—	—	—	—	—	500,544	319	58,472	140,982
U-T Offshore System *	30	—	—	30	—	—	—	306,080	63,254	245	6,028	1,506
Union Light, Heat & Power Co.	—	—	—	—	—	—	9,898	8,380	104,415	13,022	190,713	3,246
United Cities Gas Co.	599	—	—	599	—	—	46,458	—	297,346	33,075	221,276	2,752
United Gas Pipe Line Co. *	7,277	1,935	28	9,240	29	11	12,591	645,171	1,146,326	30,712	496,080	73,610
Valero Interstate Transmission Co.	—	—	—	—	—	—	—	52,263	11,531	165	3,772	—3,454
Valley Gas Transmission Inc.	—	200	—	200	—	—	—	3,650	3,012	35	284	—375
Viking Gas Transmission Co. (new)	549	—	—	549	8	—	17,790	108,703	77,860	888	84,718	5,639
Washington Gas Light Co.	—	—	—	—	—	—	—	—	—	—	—	—
West Texas Gas Inc.	—	—	—	—	—	—	747	—	21,534	1,611	28,619	3,789
Western Gas Interstate Co.	191	—	—	191	9	—	3,676	—	8,274	75	8,351	446
Western Transmission Corp.	61	—	—	61	—	—	—	4,895	612	—	550	298
Williams Natural Gas Co. *	5,858	3,748	176	9,782	37	49	82,003	225,595	728,358	32,263	371,857	—6,892
Williston Basin Interstate Pl. Co. *	3,150	747	152	4,049	23	7	18,659	56,183	214,662	8,176	107,536	6,049
Wyoming Interstate Co. Ltd. *	269	—	—	269	1	—	—	78,301	176,571	60	22,748	1,329
Zenith Natural Gas Co.	27	32	—	59	—	2	1,334	39	846	8	3,504	112
1990 Totals-majors (48)	189,972	54,083	4,279	248,334	1,392	730	4,621,987	19,988,378	47,953,668	3,435,258	26,052,593	2,271,246
1989 Totals-majors (46)	182,401	55,028	4,256	241,685	1,332	741	5,555,093	17,152,967	44,154,208	3,724,735	25,914,509	2,135,860
1990 Totals-all	208,358	62,148	4,436	274,942	1,513	768	5,744,957	21,063,151	55,287,854	3,784,166	32,195,896	2,677,568
1989 Totals-all	205,606	63,201	4,594	273,401	1,458	763	7,134,907	19,145,579	54,244,640	2,196,369	32,343,905	2,494,238

Source: FERC Forms 2 and 2-A for major and nonmajor natural-gas pipeline companies. Under criteria established for the 1984 reporting year (O.G.J. Nov. 25, 1985, p. 80). Major pipeline companies are those whose combined gas sold for resale and gas transported for a fee exceeded 50 bcf at 14.73 psi (60° F.) in each of the 3 previous calendar years. Nonmajors are natural-gas pipeline companies not classified as majors and having had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60° F.) in each of the 3 previous calendar years. * Major natural-gas pipeline companies under FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-C11, effective Feb. 2, 1985, beginning with 1984 reporting year.

Oil production triggered by crisis stays on stream throughout '91

The oil producing world proved its durability in 1991.

Replacement production capacity, rushed into use in 1990 and early 1991 after the Persian Gulf crisis removed 4.3 million b/d of oil from international trade, remained comfortably on stream through 1991—with little to spare.

Oil & Gas Journal estimates that production of crude oil and lease condensate averaged 59.9 million b/d this year, down 1.1% from output in 1990. The decline reflects a demand slump resulting from economic slowdowns in key consuming regions.

Iraq and Kuwait produced negligible volumes. Iraq remained subject to an international embargo and refused United Nations offers to allow limited exports to provide cash for humanitarian needs.

In Kuwait, well control crews worked most of the year to kill blowouts and extinguish fires set by retreating Iraqi troops in February. The last of 749 well fires was snuffed Nov. 6.

The year removed doubts about the formerly idle capacity of Organization of Petroleum Exporting Countries members accounting for most of the emergency production that followed Iraq's invasion of Kuwait on Aug. 2, 1990. There had been concerns about the condition of mothballed wells and production equipment and about the effects on reservoirs of sud-



NORTH SEA OIL PRODUCTION set records in 1991. Shown here is installation of the jacket and topsides of the Gorm F platform in the Danish sector. The platform houses water injection facilities for Gorm and Skjold fields and processing equipment for output from Dagmar field.

den production hikes.

Yet the main compensatory producers—Saudi Arabia, the United Arab Emirates, and Venezuela—kept output at elevated levels throughout the year. Before the Gulf crisis, each planned to increase production capacity in anticipation of growing demand for OPEC oil late this decade.

With lost production re-

placed, formerly idle capacity in use, and demand stalling for economic reasons, the market spent 1991 nearly in balance, which moderated the volatility characteristic of crude prices in recent years.

Upsets to 1991's balance are on the horizon. Crude stocks are high, and a demand slump is expected early in 1992. Kuwait, which hoped to be producing

400,000 b/d by yearend, plans to push output to 1.5-1.7 million by the end of 1992. At some point Iraq will restore production and exports.

Unless demand rises more than anyone expects it to, a production capacity surplus seems certain to redevelop, which means some of the big producers of 1991 will feel new pressure to cut back.

main at about 2 million b/d during the early part of the 1992. Output fluctuated wildly during 1991, culminating in a loss of 1.4 million b/d in May due to high levels of downtime needed to complete statutory safety revamps.

A feature of the high levels of output since the end of the North Sea summer is revival of Shell/Esso's Brent oil field. After a series of shutdowns for repairs and refurbishments on the four platforms, output topped 300,000 b/d in October for the first time since 1988.

Among the minor North Sea players, Danish output has edged up from 135,000 b/d at the beginning of the year to more than 150,000 b/d, mainly due to start-up of Dagmar field and slightly higher throughput from the Dan complex.

Dutch output has fluctuated around 50,000 b/d.

Soviet republics

Oil production from the former Soviet Union declined throughout 1991.

Output, which had averaged 12.04 million b/d in the first quarter of 1990, was down to 10.9 million b/d by the first 3 months of this year. Fourth quarter production averaged 10 million b/d.

OGJ estimates the full-year average at 10.3 million b/d.

The slide is expected to continue in the first half of next year. The International Energy Agency forecasts Soviet output at an average of only 9.8 million b/d during the period. The agency said western capital and technology to improve recovery from existing oil fields will not have much effect on production levels until 1993-94.

Critical is the time required for politics to stabilize enough for republics to solidify legal frameworks and accommodate international contracts. A key development of 1991 was devolution of authority to the republics, which for international companies began to clarify legal jurisdictions.

Questions remained whether the central government would try to reconsolidate power, although its prospects seemed to diminish at yearend. Ukraine voted



VENEZUELA increased oil production in late 1990 and 1991 in response to the Persian Gulf crisis and plans to raise production capacity to 5 million b/d by 2000. This pumping unit is on the eastern shore of Lake Maracaibo.

overwhelmingly for independence in November. The next month, it, Russia, and Byelorussia announced plans to form a confederation, a move that would all but eliminate any meaningful role of the central government.

Declining domestic demand for oil products, reflecting faltering economic activity, has allowed the Soviet republics to limit the fall in exports of crude and products.

In the first half of the year exports were only slightly lower than in 1990, but there was a more substantial drop in the third quarter when exports fell almost 400,000 b/d to 1.57 million b/d.

Asia-Pacific

Not all countries have been able to maintain production at levels to which they climbed during the Persian Gulf crisis.

Demand in the Far East has focused on low sulfur,

light crudes, making it difficult for Indonesia to sell some of its less desirable heavy oils. As a result, production slipped from 1.5 million b/d at the beginning of the year to 1.4 million b/d at the end.

Indonesia's average for the year was 1.43 million b/d, still 140,000 b/d more than the year before. The country, which reported record exploratory activity in 1990, has signed a number of production sharing contracts with foreign companies this year.

Malaysian output increased slightly to 629,000 b/d this year. Production sharing contractors reported several discoveries during the year, and Esso Production Malaysia announced plans to add three platforms off Terengganu to sustain its production at 360,000 b/d.

Brunei's production jumped to an average of 151,300 b/d this year from 134,000 b/d in 1990. In India, production

dropped to 647,000 b/d from 664,600 b/d.

Chinese production rose marginally to 2.8 million b/d, with all of the increase absorbed by rising domestic demand.

Several of Asia-Pacific's minor producers tallied strong gains in 1991 or will do so in the near future.

Thailand's production increased to 46,600 b/d from 42,200 b/d in 1990 as operators brought fields on stream onshore and off.

Papua New Guinea will join the ranks of oil producing countries next year, when the Kutubu onshore development operated by a Chevron Corp. unit comes on stream.

And Viet Nam and Myanmar, both marginal producers now, have encouraged exploration by foreign companies, some of which have reported discoveries likely to boost production in the near future.

Africa

Africa's light, low sulfur crudes were in high demand this year. The demand enabled Libya to boost flow by more than 100,000 b/d to an average of 1.5 million b/d for the year. Algeria's production increased marginally to 798,000 b/d.

Angolan production increased to 493,300 b/d from 470,800 b/d in 1990 and probably will increase further as recent discoveries come on stream.

Nigeria, which has been encouraging exploration and production activity, suffered an outbreak of labor unrest and production difficulties in the Forcados area offshore.

The problems crimped production by about 100,000 b/d toward yearend, but the 1991 average still managed a 56,000 b/d year to year gain to 1.86 million b/d.

As Forcados came back on stream, new production facilities started in the Mobil/NNPC Edop oil field. As production from this source grows, Nigeria's sustainable production should rise to 2 million b/d.

Egyptian production rose from 875,000 b/d at the beginning of 1991 to 900,000 b/d at yearend, averaging 885,000 b/d for the year.

Western Hemisphere

In the U.S., the 1991 production average increased by 16,000 b/d from the 1990 figure, largely due to a 200,000 b/d emergency surge early in the year.

The hike, mainly from Alaska, was temporary. U.S. production peaked in February and March at about 7.5 million b/d and declined the rest of the year.

Canada, like the U.S., spent 1991 in a drilling slump. Oil production increased by 0.3% to 1.52 million b/d. Canada's industry doldrums prompted the Alberta government late in the year to suspend royalties for some types of wells.

Latin America began to stir this year. Mexico led in oil production at nearly 2.8 million b/d, up 5% from the 1990 average, and plans increases. The reformist government of Pres. Carlos Salinas has reinvigorated the Mexican economy with an aggressive privatization campaign and restored capital spending plans for a stream-

lined Petroleos Mexicanos SA—the state oil company to which privatization does not apply.

Through 1995, the government wants Pemex to meet domestic demand, expected to increase 6-7%/year, without raising imports and to hold exports at 1 million b/d. To meet objectives, Pemex will have to up production to 3.5 million b/d by 1995.

Venezuela's average production jumped 12% to 2.34 million b/d this year thanks to relaxation of OPEC ceilings and early results of the country's efforts to lift capacity. Target is 5 million b/d by 2000. Like most of Latin America's producers, Venezuela faces major financial challenges in meeting its production goals. So far, the country has not gone as far as some in welcoming foreign exploration and development capital, although it has agreed to a gas development-LNG export scheme involving international partners. It also has offered private companies contracts for de-

velopment of marginal fields.

Ecuador, Latin America's other OPEC member, raised its production average by 2% to 293 million b/d in 1991. The country managed to raise output by 15,000 b/d to 300,000 b/d during the Persian Gulf crisis but couldn't keep it at that level.

It hopes to raise sustainable capacity to 300,000 b/d but must resolve a slate of political, financial, and environmental challenges. Conoco Inc.'s withdrawal as operator of Block 16 in October will at least delay development of a series of what once were seen as key discoveries in the country.

Argentina is in final stages of privatizing its state oil company and is aggressively offering acreage to international companies. It raised production to an average of 487,000 b/d this year from 481,000 b/d in 1990.

Brazil had to struggle with financial and labor problems at the state oil company but managed to raise its oil production average slightly to

nearly 636,000 b/d. The deepwater Campos basin yielded more major oil discoveries during the year, and the first crude oil production came on stream in the offshore Santos basin.

Colombia's oil production slipped marginally to 439,000 b/d in 1991. International companies made further discoveries, but sabotage of crucial oil and gas pipelines remained a problem.

Peru ended the downstream monopoly of its financially beleaguered state oil company and planned to sign 12 exploration contracts this year, most since the 1970s. As in Colombia, guerrilla activity hampered operations in parts of the country. Production averaged 116,000 b/d in 1991, down nearly 12%.

Trinidad & Tobago's production average slipped 4% to 145,000 b/d in 1991, but the country plans major enhanced recovery work in its onshore and offshore fields and has been encouraging activity by foreign companies.

WORLDWIDE LOOK AT RESERVES AND PRODUCTION

ESTIMATED PROVED RESERVES					OIL PRODUCTION			
COUNTRY	Jan 1, 1992		Jan 1, 1991		Producing wells* Dec 31, 1990	Estimated 1991 (1,000 b/d)	Change from 1990 (%)	Actual 1990 (1,000 b/d)
	Oil (1,000 bbl)	Gas (bcf)	Oil (1,000 bbl)	Gas (bcf)				
ASIA-PACIFIC								
Afghanistan.....		3,530		3,530				
Australia.....	1,523,700	15,057	1,566,163	15,433	1,607	543.0	-5.7	576.0
Bangladesh.....	500	25,600	500	12,700	10	0.9	0.0	0.9
Brunei.....	1,350,000	11,200	1,350,000	11,200	584	151.3	12.7	134.3
China.....	24,000,000	35,400	24,000,000	35,300	49,700	2,800.0	1.2	2,767.6
China, Taiwan.....	4,000	670	4,500	700	93	1.9	-32.1	2.8
India.....	6,126,740	25,772	7,997,100	25,049	2,514	647.0	-2.6	664.6
Indonesia.....	6,581,293	64,837	11,050,000	91,450	7,262	1,432.6	11.1	1,289.0
Japan.....	59,753	968	63,019	1,124	343	14.0	50.5	9.3
Malaysia.....	3,045,000	59,055	2,900,000	56,900	503	629.0	1.0	623.0
Myanmar (Burma).....	50,000	9,350	51,000	9,400	450	12.0	-7.7	13.0
New Zealand.....	170,230	3,449	209,000	4,106	51	40.0	5.3	38.0
Pakistan.....	162,000	22,600	162,087	19,449	97	69.5	12.1	62.0
Papua New Guinea.....	200,000	8,000	200,000	8,000				
Philippines.....	38,000	100	38,688	1,800	11	3.0	-37.5	4.8
Thailand.....	262,000	13,600	150,000	5,850	299	46.6	10.4	42.2
Viet Nam.....	500,000	100	500,000	100	NA	65.8	119.3	30.0
Total Asia-Pacific.....	44,073,216	299,288	50,242,057	302,091	63,524	6,456.6	3.2	6,257.5
WESTERN EUROPE								
Austria.....	84,984	388	81,443	403	1,242	25.9	19.4	21.7
Denmark.....	755,000	4,059	799,435	4,488	98	140.4	16.3	120.7
France.....	170,836	1,296	184,766	1,324	647	58.5	-4.4	51.2
Germany.....	449,000	8,760	425,000	12,400	2,100	74.3	-3.6	77.1
Greece.....	41,000	44	30,000	47	13	15.3	-6.7	16.4
Ireland.....		1,700		1,700				
Italy.....	692,153	11,370	693,503	11,624	222	89.5	-4.8	94.0
Netherlands.....	144,650	69,570	157,200	60,900	187	66.3	-5.7	70.3
Norway.....	7,609,400	60,670	7,609,412	60,674	308	1,864.0	15.0	1,620.5
Spain.....	21,389	740	20,000	780	44	21.3	31.5	16.2
Turkey.....	540,450	705	650,000	1,150	684	86.7	20.1	72.2
United Kingdom.....	3,994,310	19,247	3,825,000	19,775	880	1,779.3	-3.8	1,849.7
Total Western Europe.....	14,503,172	178,549	14,475,759	175,265	6,425	4,221.5	5.0	4,020.0
EASTERN EUROPE & U.S.S.R.								
Albania.....	165,000	670	165,000	700	NA	30.0	-25.0	40.0
Bulgaria.....	15,000	250	15,000	250	NA	4.0	0.0	4.0
Czechoslovakia.....	15,000	490	15,000	490	NA	3.0	0.0	3.0
Hungary.....	158,500	3,758	220,000	4,320	NA	39.0	-2.5	40.0
Poland.....	30,000	4,590	30,000	5,640	NA	2.0	0.0	2.0
Romania.....	1,150,000	3,700	1,170,000	4,700	NA	130.0	-18.8	160.0
U.S.S.R.....	57,000,000	1,750,000	57,000,000	1,600,000	148,900	10,260.0	-9.9	11,390.0
Yugoslavia.....	240,000	2,900	240,000	2,900	1,645	56.3	-11.9	63.9
Total Eastern Europe & U.S.S.R.....	58,773,500	1,766,358	58,855,000	1,619,000	150,545	10,524.3	-10.1	11,702.9
MIDDLE EAST								
Abu Dhabi.....	92,200,000	182,800	92,200,000	182,800	1,001	1,945.8	16.7	1,667.0
Bahrain.....	83,490	6,010	97,460	6,250	317	38.2	-0.3	38.3
Dubai.....	4,000,000	4,600	4,000,000	4,800	150	434.0	3.0	421.4
Iran.....	92,860,000	600,350	92,850,000	600,350	361	3,342.0	2.8	3,252.0
Iraq.....	100,000,000	95,000	100,000,000	95,000	820	280.0	-86.5	2,080.0
Israel.....	1,289	10	1,400	10	12	0.2	0.0	0.2
Jordan.....	5,000	100	20,000	400	4	0.3	0.0	0.3
Kuwait.....	94,000,000	48,000	94,525,000	48,600	363	126.3	-88.3	1,079.0
Neutral Zone.....	5,000,000	1,000	5,000,000	10,000	499	129.7	-58.4	312.0
Oman.....	4,250,000	9,900	4,300,000	7,200	1,237	705.0	4.1	677.0
Qatar.....	3,729,000	162,000	4,500,000	163,200	238	390.0	-1.0	394.0
Ras al Khaimah.....	400,000	1,200	400,000	2,000	7	0.8	0.0	0.8
Saudi Arabia.....	257,842,000	184,048	257,504,000	180,355	1,235	8,157.7	30.4	6,257.6
Sharjah.....	1,500,000	10,700	1,500,000	10,800	20	24.7	-10.5	27.6
Syria.....	1,700,000	6,400	1,700,000	5,500	963	473.0	21.9	388.0
Yemen.....	4,000,000	7,000	4,000,000	7,000	87	200.8	6.1	189.3
Total Middle East.....	661,570,779	1,319,118	662,597,860	1,324,265	7,314	16,248.5	-3.2	16,784.5

COUNTRY	ESTIMATED PROVED RESERVES				OIL PRODUCTION			
	Jan 1, 1992		Jan 1, 1991		Producing wells* Dec 31, 1990	Estimated 1991 (1,000 b/d)	Change from 1990 (%)	Actual 1990 (1,000 b/d)
	Oil (1,000 bbl)	Gas (bcf)	Oil (1,000 bbl)	Gas (bcf)				
AFRICA								
Algeria	9,200,000	116,500	9,200,000	114,700	920	798.0	0.5	794.0
Angola	1,818,173	1,800	2,074,000	1,800	428	493.3	4.8	470.8
Benin	19,500	...	100,000	...	8	4.0	2.6	3.9
Cameroon	400,000	3,880	400,000	3,880	175	151.5	-5.9	161.0
Congo	830,000	2,600	830,000	2,580	327	155.5	0.3	155.0
Egypt	4,500,000	12,400	4,500,000	12,400	907	885.0	1.5	872.0
Equatorial Guinea	...	840	...	840	...	...	...	...
Ethiopia	...	880	...	880	...	...	...	...
Gabon	730,000	450	730,000	490	310	294.7	8.9	270.7
Ghana	500	...	500	...	...	...	...	...
Ivory Coast	100,000	3,500	100,000	3,500	13	2.0	0.0	2.0
Libya	22,800,000	43,000	22,800,000	43,000	712	1,500.0	9.2	1,374.0
Madagascar	...	70	...	70	...	...	...	...
Morocco	2,139	43	2,000	53	12	0.9	0.0	0.9
Mozambique	...	2,290	...	2,290	...	...	...	...
Namibia	...	2,100	...	2,000	...	...	...	...
Nigeria	17,899,820	104,720	17,100,000	87,400	1,574	1,857.3	2.6	1,810.9
Rwanda	...	2,000	...	2,000	...	...	...	...
Somalia	...	210	...	210	...	...	...	...
South Africa	...	1,800	...	1,760	...	...	...	...
Sudan	300,000	3,000	300,000	3,000	...	...	...	...
Tanzania	...	4,100	...	4,100	...	...	...	...
Tunisia	1,700,000	3,000	1,700,000	3,000	159	104.8	13.3	92.5
Zaire	187,000	1,058	55,640	30	121	28.4	-2.4	29.1
Total Africa	60,487,532	310,241	59,892,140	289,983	5,666	6,275.4	4.0	6,036.6
WESTERN HEMISPHERE								
Argentina	1,569,987	20,449	2,280,000	27,000	10,305	487.3	1.2	481.3
Barbados	3,337	6	3,083	6	93	1.2	0.0	1.2
Bolivia	119,000	4,500	119,182	4,149	305	22.3	6.2	21.0
Brazil	2,800,349	4,046	2,840,000	4,045	6,267	635.8	0.4	633.0
Canada	5,587,798	96,734	5,782,949	97,589	39,159	1,523.3	0.3	1,518.0
Chile	300,000	4,100	300,000	4,100	331	17.8	-11.0	20.0
Colombia	1,935,200	3,889	2,000,000	4,500	3,740	439.2	-0.2	440.0
Cuba	100,000	100	100,000	100	NA	15.0	0.0	15.0
Ecuador	1,550,000	3,885	1,420,000	3,950	947	292.6	2.3	286.0
Guatemala	34,797	10	36,205	10	15	3.8	-2.6	3.9
Mexico	51,298,000	71,508	51,983,000	72,744	4,740	2,777.0	4.9	2,648.0
Peru	382,181	7,075	405,937	7,082	3,299	116.2	-11.6	131.4
Suriname	37,600	...	27,300	...	153	4.1	5.1	3.9
Trinidad & Tobago	535,000	8,900	536,000	8,910	3,203	144.9	-3.9	150.8
Venezuela	59,100,000	110,000	59,040,000	105,688	8,425	2,341.3	12.3	2,084.5
United States	26,250,000	169,300	26,177,000	166,208	597,320	7,371.4	0.2	7,355.3
Total Western Hemisphere	151,603,249	504,502	153,050,556	506,081	678,302	16,193.2	2.5	15,793.3
TOTAL WORLD	991,011,448	4,378,056	999,113,472	4,216,685	911,776	59,919.5	-1.1	60,595.0
Total OPEC	769,392,113	1,733,090	773,819,000	1,744,583	24,844	23,347.5	-0.2	23,400.5

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. *Does not include shut in, injection, or service wells.

Worldwide Production

• Offshore

(e) Estimated

(c) Condensate

(NA) Not available

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	— No. of wells —		Production		*API gravity
				Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
ABU DHABI(e)	ADNOC, OTHERS	Asab, 1965	8,000-8,700	106	248			40.8
		Bab, 1958	8,600-9,300	100	232			40.6
		Bu Hasa, 1962	8,300-9,200	201	371			39.0
		Sahil, 1967	9,500-9,800	22	52			39.7
		• Umm Sharif, 1958	9,800-12,000	142	203			37.0
		• Zakum Lower, 1963	8,000-9,000	131	254			39.0
		• Zakum Upper, 1963	7,000-8,000	142	262			35.0
		• Umm Addaiikh, 1969	7,700-8,500	32	54	1,667,000	9,999,761,800	32.5
		• Satah, 1975	8,550-9,500	10	21			39.8
		• Arzanah, 1973	11,000-11,300	14	34			44.6
		• Abu Al Bukhoosh, 1969	8,900-10,900	42	48			32.0
		• Mubarratz, 1969	8,300-10,000	28	28			37.0
		• Bunduq, 1964	9,400-10,900	23	40			40.0
		Total Abu Dhabi				1,001	1,863	1,667,000	9,999,761,800
ALGERIA(e)	SONATRACH	Zarzifine, 1957	4,700					42.2
		Edjeleh, 1956	1,500-2,800					37.2
		Tiguentounne, 1966	2,160-4,265					44.4
		El Adeb Lareche, 1958	4,100					43.3
		Assakarfaf N. & S., 1958	2,800					42.7
		Tan Emellel N. & S., 1960	2,800-4,500					42.5
		Edeyen, 1964	5,580					41.5
		Hassi Mazouia S., 1963	4,430					40.2
		Hassi Mazouia B., 1965	4,920					42.0
		Acheb W. & Krib, 1963 & 1960	7,360					45.6
		Tin Fouye N. + F6, 1962	4,265					39.6
		El Borma, 1967	8,200					42.9
		Keskassa, 1968	8,860					42.9
		Mereksen, 1974	9,420					45.8
		Gara, 1962	9,420					42.9
		Hassi Messaoud N., 1956	10,500					45.9
		Hassi Messaoud S., 1956	10,500					46.1
		Gassi-Touil & Gassi-Touil E., 1961	6,890					50.6-50.8
		Hassi Chergui	8,200					50.6
		Nezla N., 1965	8,530					51.5
		Rhourde El Baguel, 1962	9,850					40.2
		Mesdar E. & W., 1972	11,155					40.3
		El Gassi-El Agreb, 1959	10,170	920	920	794,000	8,322,776,000	47.9
		Rhourde Nouss & E., 1972	8,530					39.7
		Tin Foye Tabankort, 1966	4,600-6,560					41.1-41.3
		Djoua W., 1967	5,580-6,240					41.1
		Amassak, 1970	6,565					41.1
		Tamendjelt, 1970	5,585-6,890					41.1
		Timedratine, 1964	8,155					42.7
		Ohanet N. & S., 1960	7,878					43.8
		Askarene, 1962	8,200					41.7
		Guelta, 1962	8,960					41.7
		Stah, 1971	9,515					45.8
		Ras Toumb, 1976	9,190					35.7
		Haoud Berkouli-Ben Kahla, 1965	11,000					43.6
		Guelata-Guelata N.E., 1969	11,320					42.2-42.3
		N'Goussa, 1974	11,715					42.2
		Kef El Argoub, 1973	12,570					42.2
		Oued Noumer, 1969	8,860					48.3
		Djorf, 1974	9,025					48.3
		Djebel Onk, 1960	3,940					37.0
		Alrar FJT						
		Hassi R'Mel(c)						
		Gassi Touil(c)						
		Total Algeria				920	920	794,000	8,322,776,000
ANGOLA	FINA ANGOLA	Benfica, 1955	8,300	1	5	23	2,284,000	30.0
		Bento, 1972	7,350	1	3	207	5,152,000	36.0
		C. Cobra, 1969	4,000		11	337	3,791,000	41.0
		Cacuaco, 1958	7,870	1	4	15	285,000	30.0
		Galinda, 1959	7,220		8		2,245,000	30.0
		Ganda, 1975	5,000	9	9	4,720	8,506,000	36.0
		Legua, 1972	6,300	1	1	102	770,000	31.0
		Luango, 1977	3,800	3	3	937	2,948,000	38.0

	Name of field, discovery date	Depth, ft	No. of wells		1980 average b/d	Cumulative to Dec. 31, 1980 bbl	API gravity
			Producing	Total			
	Lumueno, 1977	4,600	9	12	2,490	5,612,000	37.0
	Mulenvos, 1968	5,900-6,600	5	12	196	5,221,000	25.0
	N/Z Kirona S & D, 1973	5,200-5,670	7	7	2,703	17,965,000	30.4
	N/Z Pangala, 1973	4,997-5,095	8	13	3,934	49,617,000	36.1
	N/Zombo, 1973	5,000-6,300	11	14	1,808	27,324,000	33.0
	Pambo, 1982	4,600	4	5	822	2,439,000	39.0
	Pinda, 1966	6,709	...	1	...	3,000	26.0
	Quenguela, 1968	6,000	20	32	1,008	38,256,000	31.0
	Quinfuquena, 1975	6,800-7,100	12	19	3,239	27,426,000	32.0
	Quingula, 1972	3,400	20	30	6,979	38,805,000	36.0
	Sereia, 1974	6,200	3	4	791	1,737,000	27.0
	Tobias, 1961	1,970	1	10	49	28,981,000	31.0
CHEVRON	• Kai, 1969	11,400-11,660	1	1	30	4,345,226	30.0
	• Kambala, 1971	10,500	4	5	4,997	23,602,197	32.8
	• Kungulo, 1975	4,000	16	17	8,984	53,475,618	32.2
	• Lifuma, 1984	7,800	1	1	81	234,864	31.4
	• Limba, 1969	2,660-7,350	13	15	12,105	97,090,800	31.6
	• Livuite, 1979	8,000	5	7	370	2,931,500	31.7
	• Malongo North, 1966	1,170-9,250	59	73	15,817	26,599,993	30.0
	• Malongo South, 1966	1,150-1,440	27	33	7,109	80,403,853	28.0
	• Malongo West, 1969	1,680-8,800	20	42	20,115	251,933,141	22.5
	• Numbi, 1980	3,446	23	33	53,211	55,763,667	34.0
	• Takula, 1971	3,070-9,090	62	73	93,285	269,720,446	31.5
	• Vuko, 1983	3,700	6	6	3,521	13,860,233	35.0
	• Wamba, 1982	2,700	6	7	23,195	38,610,809	29.0
TEXACO-SONANGOL-TOTAL-BRASPETRO	• Curtaia, 1978	7,200	...	1	...	2,265,701	31.0
	• Essungo, 1975	6,500	7	10	3,646	23,505,296	35.0
	• Lombo Este, 1983	7,800	9	10	26,649	22,935,746	41.0
	• Sulele Oeste, 1985	7,600	6	6	3,280	3,839,308	41.0
	• Sulele South 1, 1986	7,600	1	2	1,312	1,562,023	39.0
	• Tuberão, 1984	7,600	6	8	11,362	11,855,545	41.0
ELF ANGOLA	• Pacassa, 1982	11,500	14	25	62,400	87,637,500	38.0
	• Pailanca, 1981	8,860	13	21	46,050	89,242,500	40.0
	• Bistrais, 1982	10,500	6	6	20,800	13,042,500	89.0
	• Impulse South East, 1985	8,500	7	7	22,200	9,558,750	36.0
	Total Angola		428	612	470,879	1,653,496,318	

ARGENTINA

INA	YPF	Chubut, 1907.....	1,908-9,168	2,357	2,429	84,510	21.1-26.0	
		Formosa, 1984.....	11,466-11,490	13	14	9,483	42.0-42.9	
		Jujuy, 1969.....	2,461-16,732	10	10	735	46.5-47.0	
		La Pampa, 1968.....	3,609-4,921	223	230	9,137	31.0	
		Mendoza, 1932.....	2,178-16,778	1,056	1,092	10,756	23.7-32.0	
		Neuquen, 1918.....	1,312-12,498	1,265	1,348	105,905	24.0-41.0	
		Rio Negro, 1960.....	2,953-7,546	981	1,002	7,059	22.5-41.0	
		Salta, 1928.....	6,551-15,092	34	48	6,770	29.0-59.0	
		Santa Cruz, 1946.....	1,468-17,060	3,051	3,149	93,848	21.1-30.0	
		Tierra del Fuego, 1959.....	5,249-7,824	215	220	44,048	43.4-46.0	
AMOCO		Cerro Dragon, 1958.....	7,200	1,100	1,600	41,058	454,455,459	21.0
OTHER OPERATORS ^(a)		All fields.....	---	---	---	68,000	24,820,000	---
		Total Argentina.....		10,305	11,142	481,309	5,334,985,459	

AUSTRALIA

BARRACK ENERGY	• Mount Homer, 1965	3,800-5,800	7	8	605	440,248	38.0
BHP PETROLEUM PTY. LTD.	• Challis/Cassini, 1984	5,000	7	7	30,300	11,600,000	39.5
	• Jabiru, 1983	4,786	4	4	53,300	55,600,000	42.3
HADSON ENERGY LTD.	• Harriet, 1983	6,230	12	12	11,900	19,260,000	38.2
AQL PETROLEUM	• Alton, 1964	6,000	3	8	28	1,919,391	49.5
	• Anabranck, 1965	4,188	...	...	...	13,718	44.0
	• Bennett, 1965	5,960	1	1	5	120,266	45.0
	• Cabawin, 1961	10,800	1	1	2	62,986	49.0
	• Maffra, 1965	4,251	1	1	13	42,945	48.0
	• Mereneie, 1964	4,000	24	37	1,500	5,152,475	48.9
	• Merit, #1, 1985	4,521	1	1	66	74,358	51.0
	• Moonie, 1961	5,800	19	38	500	22,286,028	44.5
	• Richmond, 1963	3,643	1	1	...	16,388	43.0
	• Snake Creek, 1964	4,990	...	...	...	13,158	67.0
	• Sunny Bank, 1982	6,139	...	...	...	706	40.0
	• Trinidad 1 & 3, 1965	4,599	1	1	...	63,594	46.0
EROMANGA ENERGY	• Blina, 1981	4,300	5	6	222	1,345,650	38.0
	• Boundary, 1990	3,940	1	1	44	220	31.0
	• Lloyd, 1987	4,806	1	1	44	144,340	37.0
	• Sundown, 1983	3,600	2	4	14	196,560	39.0
	• West Terrace, 1985	3,800	2	2	30	146,920	33.0
WOODSIDE	• North Rankin, ^(c) 1972	9,800	20	20	30,000	37,000,000	53.1
COMMAND	• Dilkeria, 1989	3,447	1	1	17	5,747	46.0
	• Fairymount, 1985	6,730	5	6	489	617,003	50.5

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
	Kihse, 1986	3,200	...	1	...	813	44.7
	Koora, 1985	4,822	...	1	...	952	41.0
	Maxwell South, 1989	2,822	1	1	62	19,650	47.2
	Maxwell, 1987	2,930	3	3	245	268,960	47.2
	Mindagabie, 1987	5,290	...	1	...	658	40.3
	Muthero, 1989	3,448	1	1	76	36,304	44.4
	Nockatunga, 1983	3,310	3	5	104	373,142	48.0
	Thungo, 1988	3,345	4	4	271	387,982	46.8
	Winna, 1985	3,300	2	2	73	150,728	45.8
ESSO-BHP	• Barracouta, 1965	4,550	7	10	1,140	35,498,000	62.8
	• Bream, 1969	6,200	14	24	30,190	20,260,000	44.0
	• Cobla, 1972	7,700	10	12	23,010	94,456,000	44.8
	• Dolphin, 1967	4,000	1	1	7,840	2,788,000	45.0
	• Flounder, 1968	8,200	19	22	26,640	36,487,000	46.7
	• Fortescue, 1978	7,700	14	28	42,630	206,886,000	43.0
	• Halibut, 1967	7,700	11	16	30,520	733,447,000	43.3
	• Kingfish, 1967	7,500	23	30	37,330	979,933,000	46.9
	• Mackarell, 1969	7,700	14	18	23,250	397,849,000	45.8
	• Marlin, 1968	5,100	18	22	6,700	64,647,000	50.0
	• Perch, 1968	3,700	1	1	9,150	3,341,000	41.0
	• Seahorse, 1978	4,700	1	1	710	280,000	53.0
	• Snapper, 1968	4,350	11	27	6,800	18,681,000	47.0
	• Tarwhine, 1981	4,500	1	1	3,350	1,222,000	58.0
	• Tuna, 1968	6,500	11	18	10,670	41,647,000	40.5
	• West Kingfish, 1968	7,500	16	19	40,120	98,527,000	46.9
	• Whiting, 1983	4,800	4	5	14,800	5,924,000	53.0
MARATHON AUST	• Talisman, 1984	9,600	2	2	4,953	4,484,554	41.0
OIL COMPANY OF AUSTRALIA	Black Stump, 1986	3,815	1	1	50	169,838	45.2
	Bodalla South, 1984	4,789-5,215	6	7	746	4,063,669	47.8
	Bora Creek, 1982	4,900	1	1	2	18,186	34.0
	Cogoon River West, 1990	4,660	...	1	...	...	...
	Kenmore, 1985	4,593-4,986	9	11	1,915	4,652,099	48.2
	Kincora, 1980	4,700	1	1	10	307,058	34.0
	Riverslea, 1981	4,950	2	2	55	374,206	37.0
	Sandy Creek, 1982	4,900	...	1	...	8,730	34.0
	Waratah, 1982	5,350	3	4	40	312,503	34.0
	Washpool, 1985	5,250	1	1	5	3,650	35.0
WESTERN MINING CORP.	• Chevill, 1983	3,360	2	2	2,266	1,300,595	45.0
	• North Herald, 1983	3,837	1	1	1,641	3,462,228	45.0
	• South Pepper, 1983	4,036	6	6	5,741	5,365,015	45.0
BRIDGE OIL LTD.	Boggo Creek, 1980	5,320	...	1	...	3,000	46.0
	Louise, 1986	5,910	1	2	32	109,686	58.0
	Narrows, 1986	5,739	1	1	7	25,439	60.0
	Taylor, 1988	5,538	11	14	768	785,591	47.0
	Thomby Creek, 1979	5,170	...	3	...	54,000	50.0
	Waggamba, 1978	7,670	1	1	12	20,962	55.0
	Yellowbank Creek, 1982	5,180	1	2	23	372,817	52.0
AMPOLEX (PPL) PTY. LTD. (e)	Cranstoun, 1987	4,250	1	1	...	...	48.0
	Endeavour, 1989	5,085	1	1	...	...	49.7
	Ipundu, 1986	2,700	1	1	...	...	43.0
	Ipundu, North, 1989	4,354	1	1	...	...	49.7
	Monier, 1987	4,150	2	2	...	...	49.0
	Talgeberry, 1985	3,900	2	3	...	...	46.0
	Takayah, 1985	3,800	1	1	...	...	43.0
	Tarbat, 1988	2,700	1	1	...	...	43.0
	Tintaburna, 1984	3,500	5	6	...	...	43.0
	Toobunyah, 1985	3,500	4	5	...	...	43.0
SANTOS LTD. (e)	Alwyn, 1985	5,200	2	2	...	...	41.0
	Big Lake, 1984	6,600	2	3	...	...	45.0-48.0
	Bogala, 1984	6,900	2	2	...	...	40.0
	Bookabourdie, 1985	7,000	2	2	...	...	46.0
	Broiga, 1983	9,547	1	1	...	...	53.0
	Challum, 1983	...	...	1	...	...	...
	Chookoo, 1985	6,000	4	8	...	...	45.0
	Cook, 1985	...	...	1	...	...	...
	Corolla, 1989	...	1	1	...	...	...
	Cooroo/Cooroo North, 1986	...	4	5	...	...	...
	Dingers, 1987	...	...	1	...	...	...
	Dinkala, 1986	7,000	1	1	...	...	56.0
	Dullangan, 1979	5,200	15	31	...	...	54.0
	Fly Lake, 1971	9,300	1	3	...	...	53.0
	Gidgealpa, 1984	6,150	13	13	...	...	45.0-50.0
	Gidgee, 1989	...	1	1	...	...	...
	Gunn, 1983	6,000	1	1	...	...	40.0
	James, 1989	...	1	1	...	...	...
	Jackson, 1981	4,750	35	36	...	...	40.0-48.0
	Jackson South, 1982	4,800	5	8	...	...	40.0
	Jena, 1985	5,200	4	4	...	...	41.0
	Kerummura, 1985	...	...	1	...	...	50.8
	Kerinn, 1984	4,300	...	1	...	...	41.0

	Name of field, discovery date	Depth, ft	No. of wells		Production		*API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
	Limestone Creek/Bala, 1984	5,100	10	11			41.0
	Mawson, 1987	...	1	1			...
	McKinlay, 1985	5,100	1	2			41.0
	Merapi, 1985	5,660	3	3			1.0
	Merrimela, 1983	5,250-7,070	10	11			5.5
	Moolampah, 1985	6,000	2	2			...
	Moorani, 1971	7,705-9,400	6	6			6.9
	Munro, 1988	...	2	2	113,574	383,271,834	...
	Mutero, 1985	6,000	5	5			5.0
	Nacowiah, 1989	...	1	1			...
	Nacowiah East, 1988	...	1	1			...
	Nacowiah South, 1983	6,000	9	10			...
	Nacowiah West, 1983	5,700	9	9			...
	Narconowie, 1983	6,000	2	2			...
	Natan	...	1	1			...
	Nungaroo, 1985	4,150	1	1			...
	Pinaroo, 1989	...	1	1			...
	Pintari North, 1988	...	1	1			...
	Pitchery, 1988	...	1	1			...
	Sigma, 1983	5,700	2	2			...
	Spencer, 1986	6,500	6	6			7.0
	Strzelecki, 1978	5,800	15	17			...
	Sturt, 1988	...	4	4			...
	Sturt East	...	4	4			...
	Taloota, 1988	...	2	2			...
	Tantanna, 1988	...	4	4			...
	Tickalara, 1984	5,600	5	5			...
	Tinilla, 1983	6,000	1	1			...
	Timawarra, 1970	9,500	29	40			2.0
	Toby, 1987	...	...	1			...
	Utandi, 1985	5,200	3	3			0.4
	Wandilo, 1989	...	2	2			...
	Wancoocha, 1984	6,000	3	6			54.0
	Watson, 1985	...	2	2			...
	Watson South, 1985	5,500	2	2			40.0
	Wilson, 1983	5,000	5	6			...
	Woolkina, 1982	9,700	1	2			...
	Yanda, 1984	8,000	1	1			...
WAPET GROUP ^(a)	Barrow Island, 1964	1,200-6,700	412	539			37.7
	Dongara, 1969	5,250-5,577	1	9			35.5
	Thevinard Island, 1985	4,600-5,750	7	7			48.2
STRATA OIL ^(a)	Woodside, 1980	7,400	...	...			54.0
Total Australia			1,060	1,386	576,000	3,308,380,552	
AUSTRIA							
MOBIL/SHELL	Gaiselberg, 1936	5,200	33	63	676	32,898,048	25.0
	Kemating, 1979	6,100	7	9	578	4,459,284	34.0
	Sattledt, 1971	5,700	11	19	528	5,642,300	37.0
	Other	...	55	153	1,376	47,429,636	33.0
OEMV	Hochleiten, 1977	3,100-5,000	29	45	1,012	2,245,614	21.3
	Matzen, 1949	6,100	736	904	10,754	393,242,308	25.7
	Muehlberg, 1942	3,900-5,500	36	48	262	40,722,888	35.0
	Piperbach, 1968	3,500	7	8	162	4,106,580	39.0
	Pirawarth, 1957	1,600-6,500	56	65	1,059	13,367,250	28.4
	Schoenkirchen-Prottes Tief, 1962	7,800-10,100	14	20	3,577	61,236,735	31.1
	St. Ulrich, 1936	1,600-4,300	85	167	691	43,614,185	31.1
Total Austria			1,242	1,861	21,722	687,291,585	
BAHRAIN							
BANOCO	Airali, 1932	1,850-4,600	317	368	38,276	827,570,740	33.0
Total Bahrain			317	368	38,276	827,570,740	33.0
BARBADOS							
BARB. NOC	Woodbourne, 1966	1,665-6,701	93	156	1,245	5,861,102	27.2
Total Barbados			93	156	1,245	5,861,102	27.2
BENIN							
PROJET PETROLIER DE SEME	Seme, 1968	6,232	8	9	3,878	15,184,088	22.6
Total Benin			8	9	3,878	15,184,088	
BOLIVIA							
YPFB	Caigua, 1973	3,280	...	...	...	6,194,981	45.0
	Cambelt, 1976	5,787	6	6	97	1,038,616	48.0
	Camini, 1927	3,936	42	50	332	48,708,280	55.0
	Carandia, 1960	13,032	...	...	...	54,359,920	60.0
	Cascabel, 1985	11,319	2	2	369	364,103	45.6
	Colpa, 1962	9,184	...	...	...	18,284,329	65.0
	Espino, 1979	14,655	...	...	...	966,307	56.2
	H. Suarez R., 1982	7,820	3	3	375	623,436	35.0
	La Pena, 1965	8,856	30	41	4,346	30,205,438	43.0
	Monteagudo, 1967	4,592	22	24	1,086	32,977,717	41.0

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		°API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
Naranjillos, 1964	4,806	14	14	112	133,505	65.3
Palmar, 1964	10,758	2	4	71	1,772,143	65.0
Rio Grande, 1962	9,512	35	44	1,628	62,053,852	62.0
San Roque, 1981	7,170	13	14	2,651	2,317,666	71.0
Santa Cruz, 1965	9,350	8	9	340	1,863,301	65.0
Sirani, 1985	13,999	5	5	943	657,814	65.3
Tatarenda, 1954	2,296	9	12	159	7,513,246	51.0
Tita, 1976	6,450	5	5	77	4,436,605	67.9
Vibora, 1988	12,949	5	5	880	649,632	57.7
Villamontes, 1987	9,770	2	3	212	632,212	57.0
Vuelta Grande, 1978	8,220	18	18	2,729	4,269,758	67.0
Other	...	26	38	605	16,772,221	...
PLUS PETROL						
Bermejo, 1924	2,085	15	30	6	2,260	42.0
SOL PETROL						
Buena Vista, 1956	4,881	1	1	25	12,347	45.8
Camatindi, 1929	4,110	3	3	101	43,684	42.4
Caigua, 1973	3,280	1	1	1	296	42.4
PEREZ						
Caranda, 1960	13,032	37	45	346	126,387	60.0
Colpa, 1962	9,184	18	19	316	114,786	65.0
OCCIDENTAL						
Porvenir, 1978	9,600	10	10	1,565	12,553,382	60.5
TESORO BOLIVIA PETROLEUM CO.						
Escondido, 1980	11,293	5	6	16	5,922	60.0
La Vertiente, 1977	15,230	6	7	920	5,145,532	50.0
Los Suns, 1981	13,577	1	1	...	...	50.0
Taiguati, 1981	10,174	2	2	625	317,770	63.0
Total Bolivia		343	418	20,918	315,075,607	

BRAZIL (e)

ALAGOAS	Furado, 1969	4,440-5,500	51	68	...	35.0
	• Mero, 1974	6,500-7,400	...	...	...	35.0
	Pilar, 1981	4,100-5,100	56	62	...	40.0
	Tabuleiro de Martins, 1957	3,900-4,950	28	29	...	27.0
	Other	...	18	27	...	...
AMAZONAS	Igarape Cuia, 1985	3,600-3,700	...	...	...	41.0
	Rio Urucú, 1986	7,500-8,300	13	13	...	44.0
BAHIA	Agua Grande, 1951	820-4,265	113	124	...	40.0
	Aracas, 1965	3,280-8,856	149	181	...	41.0
	Buracica, 1959	1,476-1,840	171	190	...	35.0
	Candeias, 1941	3,280-7,415	36	39	...	30.0
	• Candeias Mar, 1941	3,300-7,400	17	17	...	30.0
	Cassarongongo, 1959	1,475-4,755	153	159	...	32.0
	Cexis, 1983	1,670-5,230	34	34	...	30.0
	• Dom Joao Mar, 1947	920-3,000	219	289	...	38.0
	Dom Joao Terra, 1947	920-1,350	57	94	...	38.0
	Faz. Alvorada, 1983	2,100-4,900	80	80	...	31.0
	Faz. Balsamo, 1983	2,500-4,000	114	115	...	31.0
	Faz. Boa Esperanca, 1966	7,215-8,036	21	23	...	39.0
	Faz. Imbe, 1964	2,130-5,575	59	78	...	40.0
	Faz. Panelas, 1962	2,400-5,100	14	27	...	37.0
	• Ilheus, 1979	1,500	...	...	...	41.0
	Maiombe, 1966	3,280	9	15	...	41.0
	Mata/Remanso, 1971	4,445-4,560	63	76	...	35.0
	Miranga, 1965	3,280-3,936	227	322	...	40.0
	Riacho da Barra, 1982	2,910-3,998	51	63	...	39.0
	Rio Dos Ovos, 1979	2,410-3,750	10	10	...	35.0
	Rio Pojuca, 1982	5,600-6,200	29	42	...	35.0
	Rio do Bú, 1984	2,900-3,000	50	50	...	33.0
	Santana, 1962	2,400-4,000	5	6	...	37.0
	Sesmaria, 1963	3,100-4,600	26	26	...	40.0
	Taquipe, 1958	3,115-3,935	109	138	...	40.0
	Other	...	150	239	...	...
CEARÁ	• Atum, 1983	5,800-6,750	20	22	...	25.0
	• Curima, 1978	6,888	15	17	...	32.0
	• Espada, 1983	5,750-6,900	6	6	...	26.0
	Faz. Belem, 1980	1,150-2,500	281	567	...	13.0
	• Xareu, 1977	5,717-5,766	25	27	...	39.0
ESPIRITO SANTO	• Cacao, 1978	9,184	7	12	...	32.0
	Faz. Cedro, 1962	5,248	11	14	...	28.0
	Lagoa Parda, 1977	5,576	49	50	...	30.0
	Lagoa Piabanhã, 1984	6,500	2	2	...	27.0
	Lagoa Surucua, 1982	6,400	22	26	...	30.0
	Rio Itaunas, 1977	5,400	40	40	...	28.0
	Rio Preto/Oeste/Sul, 1976	...	37	37	...	...
	Sao Mateus, 1969	5,750	45	53	...	27.0
	Other	...	125	125	...	...
RIO DE JANEIRO	• Albacora, 1984	8,430	7	12	...	26.0
	• Anequim, 1981	8,200-8,500	2	2	...	27.0
	• Area RJS-150, 1983	7,300	...	...	...	26.0
	• Area RJS-236 Triha, 1983	8,800-11,000	3	3	...	28.0
	• Area RJS-387, 1987	11,300	3	3	...	34.0
	• Badejo, 1981	8,500-10,500	5	6	...	28.0
				633,000	2,887,699,940	

	Name of field, discovery date	Depth, ft	No. of wells		Production		*API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
	• Bagre, 1983	8,700-9,000	7	9			25.0
	• Bocado, 1982	8,000-11,000	11	13			22.0
	• Bonito, 1977	6,950-8,000	11	17			27.0
	• Carapeba, 1982	10,100	29	36			23.0
	• Cheme, 1982	9,900-10,200	29	41			27.0
	• Corvina, 1983	9,000-11,000	5	8			25.0
	• Enchova, 1976	6,973-7,885	4	24			23.0
	• Garoupa, 1974	11,382	19	20			30.0
	• Garupinha, 1974	12,693	3	3			30.0
	• Linguado, 1981	9,000-11,000	11	18			20.0
	• Marimba, 1983	8,900-9,200	5	5			28.0
	• Moreia, 1984	8,200-9,500	5	6			22.0
	• Namorado, 1975	10,083	27	45			28.0
	• Pampo, 1977	6,215	24	31			21.0
	• Parati, 1982	8,900-9,200	1	1			35.0
	• Pargo, 1975	11,840	16	21			20.0
	• Pirauna, 1982	8,000-10,500	7	8			27.0
	• Sul de Pampo, 1978	9,300-9,600	...	...			20.0
	• Vermelho, 1983	11,200	45	62			24.0
	• Viola, 1981	9,200-9,900	8	8			13.0
RIO GRANDE DO NORTE	• Agulha, 1975	5,412	5	6			33.0
	Alto do Rodrigues, 1981	990-1,120	290	292			18.0
	• Area 1-RNS-36, 1982	...	...	...			32.0
	Canto do Amaro, 1986	2,500-3,600	470	486			25.0
	Estreito/Rio Panon, 1983	650- 820	447	447			16.0
	Faz. Pocinho, 1982	1,450-2,000	174	174			35.0
	Guamaré, 1983	1,400-1,600	30	33			25.0
	Livramento, 1986	2,500-3,300	30	30			41.0
	Lorena, 1984	1,200-1,700	12	12			28.0
	• Macau-Mar, 1986	3,000	5	5			31.0
	Macau/Terra, 1982	3,000-3,300	2	2			31.0
	Palmeiras, 1982	1,450-1,800	...	...			25.0
	Serrana, 1982	3,200-3,900	38	38			27.0
	• Ubarana, 1973	7,216-8,365	77	92			40.0
	Upanema, 1985	1,110-1,800	15	18			28.0
	Other	...	118	119			...
PARÁ	• Area 1-PAS-11, 1983	...	...	...			41.0
MARANHÃO	São João, 1983	4,950-6,200	...	...			40.0
SERGIPE	Ataiaia Sul, 1961	1,450	2	3			24.0
	Brejo Grande, 1967	1,670	12	12			28.0
	• Caioba, 1969	6,232-6,890	10	14			36.0
	• Camurim, 1970	6,232	61	62			25.0
	Cannopolis, 1963	2,460	852	1,008			24.0
	• Dourado, 1970	3,620-3,635	4	4			36.0
	• Guancema, 1968	3,335-4,430	13	16			41.0
	Riachuelo, 1961	1,475	235	318			28.0
	• Robalo, 1973	3,300-4,500	...	...			30.0
	Sirinzinho, 1967	1,640	177	260			30.0
	Other	...	84	85			...
	Total Brazil		6,267	7,574	633,000	2,887,599,940	
BRUNEI							
SHELL	• Ampa SW, 1963	7,068-8,155	105	222	52,087	562,000,000	41.0
	• Champion, 1970	4,300	138	245	37,092	327,000,000	23.0
	• Fairley, 1969	10,740	41	54	11,844	119,500,000	40.0
	• Fairley-Baram, 1973	9,500	4	5	—	12,400,000	40.0
	• Magpie, 1975	...	13	23	15,643	85,000,000	31.0
	Rassu, 1929	...	8	20	2,176	6,200,000	30.0
	Seria-Total, 1929	...	275	562	15,423	994,000,000	34.0
	Total Brunei		584	1,131	134,265	2,106,100,000	
CAMEROON(6)							
ELF	• Betika, 1972	5,300					42.5
	• Ekoundou S., 1975	6,200					24.0
	• Kole, 1974	5,500					31.0
	• Kombo Center, 1976	5,900					37.0
	• Kombo North, 1978	7,200					35.0
	• Ekoundou Horst plus Center, 1972	7,200					29.0
	• Boa, 1976	5,900					35.0
	• Bevo South, 1976	5,600					29.3
	• Betika S. Marine, 1979	6,300	175	179	161,000	560,269,900	30.0
	• Ekuondou N. Marine, 1977	5,250					36.0
	• Mokoko NE plus Abana, 1977	4,600					29.0
	• Asoma Marine, 1973	3,600					19.0
	• Kita E. Marine, 1978	6,900					40.8
	• Mokoko S. Marine, 1977	3,700					17.0
	• Inova Marine, 1976	6,200					32.8
	TOTAL-CFP	5,250-5,900					40.0
	• Mourfi D., 1980	3,300					21.3
	Total Cameroon		175	179	161,000	560,269,900	

		— No. of wells —		Production		API gravity	
Name of field, discovery date		Depth, ft	Producing	Total	1990 average b/d		Cumulative to Dec. 31, 1990 bbl
CANADA							
ALBERTA							
	Pembina, 1953	3,000-6,133	3,363	4,278	90,310	1,310,762,067	32.0-37.0
	Redwater, 1956	2,012-3,200	566	883	11,339	798,234,221	35.0
	Swan Hills, 1957	8,100	526	836	36,746	708,688,748	40.0
	Rainbow, 1965	4,994-6,160	272	379	37,761	543,104,399	38.0-42.0
	Bonnie Glen, 1952	3,959-6,779	115	167	8,251	510,178,088	34.0-44.0
	Judy Creek, 1951	6,307-6,701	169	268	18,342	409,254,295	43.0
	Leduc-Woodbend, 1947	3,082-5,380	137	697	2,467	379,051,664	40.0
	Swan Hills S., 1959	8,400	163	201	11,504	353,776,548	...
	Wizard Lake, 1951	4,044-5,973	43	47	7,048	328,425,732	...
	Fenn-Big Valley, 1950	3,900-5,400	109	235	3,891	319,092,568	32.0
	Mitsue, 1964	5,908	291	413	31,909	305,507,520	43.0
	Nipiss, 1965	5,648-5,726	264	365	26,070	295,332,578	41.0
	Golden Spike, 1949	3,570-5,961	64	85	2,033	183,242,716	36.0
	Virginia Hills, 1957	9,210	149	196	17,350	159,981,121	34.0
	Sturgeon Lake S., 1953	4,912-8,471	86	146	12,811	152,306,337	...
	Carson Creek N., 1958	8,787-8,935	36	62	7,006	145,868,731	44.0
	Turner Valley, 1913	3,100-9,150	114	156	2,598	141,816,752	39.0
	Westrose, 1952	6,818	31	44	7,260	136,625,134	...
	Acheson, 1950	3,390	55	116	5,440	134,165,880	38.0
	Williston Green, 1956	5,157	502	827	7,249	122,878,988	...
	Provost, 1946	2,760-2,898	1,759	2,243	48,932	112,742,433	...
	Kaybob, 1957	4,870-9,577	66	97	7,358	107,314,832	...
	Grand Forks	...	396	498	23,596	106,930,338	...
	Joarcam, 1949	3,179	176	272	6,439	106,824,297	...
	Joffre, 1953	4,983-6,779	97	186	3,547	85,934,655	...
	Kaybob S., 1958	5,600-10,042	70	98	7,730	85,195,161	...
	Zama, 1966	3,702	114	236	6,033	80,228,356	33.0-37.0
	Medicine River, 1954	5,435-7,600	243	368	9,777	78,654,937	...
	Innisfail, 1956	6,730-8,440	30	69	3,729	78,043,471	...
	Harmattan East, 1954	6,358-8,766	108	146	4,054	75,817,721	...
	Wainwright, 1925	1,903-2,200	608	752	8,909	75,810,522	...
	Bellshill Lake, 1955	2,950	413	460	10,451	71,308,502	...
	Rainbow South, 1965	6,102-6,400	47	80	5,775	68,549,575	...
	Countess, 1951	2,858-4,272	147	192	6,399	68,389,283	...
	Harmattan Elktion, 1955	8,796-10,757	61	83	4,385	65,094,248	...
	Bantry, 1940	2,574-3,300	189	239	10,571	56,600,025	...
	Snipe Lake, 1962	8,500	36	92	3,230	56,466,755	...
	Utikuma Lake, 1963	5,624	113	138	11,072	56,281,474	...
	Clive, 1951	6,074-6,208	126	193	4,844	54,714,329	...
	Lloydminster, 1933	1,690-1,945	104	114	5,015	53,055,037	...
	Gilby, 1962	4,201-7,000	69	156	2,939	49,583,664	...
	Caroline	...	198	291	6,968	43,354,786	...
	Red Earth	4,184-4,878	187	269	4,631	41,420,766	...
	Simonette, 1958	10,500	32	48	2,151	39,787,982	...
	Westpenn	...	11	13	12,816	35,371,839	...
	Cessford, 1950	2,800-3,028	186	303	2,582	32,954,626	...
	Taber N., 1966	3,110-3,270	87	129	6,257	19,257,303	...
	Hayter, 1966	2,030-2,815	313	428	7,466	18,097,042	...
	Valhalla, 1973	1,815-7,080	253	308	8,562	16,845,869	...
	Other	...	8,892	14,022	318,973	1,711,303,423	...
BRITISH COLUMBIA							
	Boundary Lake, 1957	3,418-4,575	277	358	9,055	178,555,258	40.0
	Eagle West, 1976	2,170-3,940	50	85	4,898	30,986,860	...
	Other	...	377	825	19,252	247,370,990	...
MANITOBA							
	All fields	...	1,353	1,581	12,720	175,313,763	...
SASKATCHEWAN							
	Weyburn, 1955	4,600	821	895	18,867	299,436,322	...
	Steelman, 1950	...	646	731	7,615	261,231,030	...
	Other	...	12,199	16,939	185,154	1,846,534,988	...
ONTARIO							
	All fields	...	1,091	1,588	4,251	65,333,969	...
NEW BRUNSWICK							
	All fields	...	...	...	...	805,261	...
NORTHWEST TERRITORIES							
	All fields	...	159	164	31,740	88,982,306	...
Total Canada*			39,159	56,098	1,204,127	14,184,338,085	
CHILE							
ENAP							
	Gaviota Norte, 1990	7,000	3	3	335	122,208	38.0
ENAP-MAINLAND							
	Canadon, 1962	6,090	8	62	99	14,658,419	38.4
	Daniel, 1960	5,806	11	121	238	34,640,428	25.4
	Daniel Este, 1961	5,523	8	66	366	28,633,836	25.0
	Delgada Este, 1958	7,694	11	31	170	4,997,094	35.0
	Dungenes, 1962	5,251	3	19	141	4,132,300	28.6
	Faro Este, 1959	7,381	4	32	132	3,410,798	35.0
	Poseidon, 1960	5,622	36	76	706	21,942,849	63.6
	Other	...	13	118	1,746	18,243,028	...
TIERRA DEL FUEGO							
	Calafate, 1955	6,045	14	61	553	26,323,717	49.3
	Catalina, 1956	5,756	8	26	223	6,696,621	38.7
	Catalina Sur, 1961	5,779	1	43	14	6,390,056	44.0
	Chanarillo, 1951	7,404	2	17	48	7,259,121	58.2
	Cullen, 1954	5,730	12	106	319	41,349,440	41.8
	Gornion, 1986	6,025	6	10	466	1,187,719	39.0
	San Sebastian Norte, 1986	6,870	2	4	34	180,732	37.0

*Does not include oil sands production or wells.

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 mb	
Sombero, 1951	7,126	2	23	4	13,110,418	40.2
Tres Lagos, 1957	5,724	18	84	418	16,300,532	40.1
Victoria Sur, 1950	7,431	3	34	53	7,896,085	41.1
Other	...	37	264	1,125	31,789,389	...
STRAIT OF MAGELLAN						
Daniel Este-Dungeness, 1977	6,126	18	36	1,142	5,102,249	36.9
Jaiba, 1978	6,650	...	3	34	326,576	46.5
Ostion, 1977	7,156	12	13	560	8,518,539	33.0
Pejerrey, 1984	7,229	19	67	712	10,219,611	39.0
Posesion, 1977	6,727	15	39	489	5,734,362	34.5
Sikus, 1986	5,932	25	39	3,230	4,144,487	32.0
Spiteful, 1977	6,296	30	82	2,307	44,376,313	34.5
Spiteful Norte, 1978	7,150	10	32	378	9,799,172	39.0
Total Chile	...	331	1,511	18,042	375,486,071	...

CHINA^(a)

CNPC

Daqing, 1959	...	...	...	1,115,446	...	...
Shengli, 1962	...	...	...	671,536	...	...
Huabei	...	...	...	107,293	...	...
Liaohe, 1964	...	...	...	272,745	...	...
Xinjiang	...	...	...	136,373	...	...
Dagang, 1964	...	...	...	78,810	...	...
Henan	...	...	...	50,538	...	...
Zhongyuan, 1981	...	...	...	126,345	...	...
Jilin, 1978	...	49,700	49,700	71,195	15,710,067,000	...
Changqing	...	...	...	29,280	...	...
Hanjiang	...	...	...	7,621	...	...
Yumen	...	...	...	10,830	...	...
Jiangsu	...	...	...	17,047	...	...
Qinghai	...	...	...	16,044	...	...
Sichuan	...	...	...	2,607	...	...
Jidong	...	...	...	7,019	...	...
Cnooc	...	...	...	25,269	...	...
Other	...	...	...	23,264	...	...
Total China	...	49,700	49,700	2,787,564	15,710,067,000	...

CHINA, TAIWAN

CHINESE PETROLEUM

Chinghsu & CBK ^(b) , 1967	...	7	26	1,588	3,506,185	50.0
Chinshui & Yunghoshan ^(b) , 1971	...	23	36	265	5,441,228	45.0
Chuhuangkeng ^(b) , 1904	...	30	32	162	2,839,361	50.0
Tiehengshan ^(b) , 1962	...	24	31	779	16,112,406	51.0
Other ^(c)	...	9	10	5	45,213	...
Total China, Taiwan	...	93	135	2,799	26,944,373	...

COLOMBIA

ARGOSY^(a)HOCOL SA (SHELL)^(a)ECOPETROL^(a)

Bourdin, 1974	11,000	2	4	...	...	26.7
Maxima, 1976	11,000	1	1	...	...	11.0
Nancy, 1974	11,000	1	1	...	...	26.0
Paigrande, 1971	6,500	32	36	...	...	20.0
Piaco, 1981	7,000	6	7	...	...	21.0
San Francisco, 1985	2,800	41	41	...	...	27.0
Hato Nuevo, 1984	6,900	2	4	...	...	26.0
Tenay, 1985	11,500	3	3	...	...	26.3
Santa Clara, 1987	2,100	5	6	...	...	19.0
La Jagua, 1986	5,300	2	2	...	...	22.0
Loma Larga, 1985	3,500	1	1	...	...	22.4
Bnass, 1973	4,200	4	6	...	...	23.5
Dina T, 1982	3,600	51	64	...	...	20.0
Dina K, 1989	6,500	22	26	...	...	22.0
La Canada, 1966	700	5	7	...	...	22.0
Tello, 1972	7,500	30	34	...	...	19.0
Cebu, 1981	6,500	8	10	...	...	...
Aplay, 1981	10,800	13	15	...	...	23.0
Aplay Este, 1987	10,300	1	1	...	...	16.0
Boquete, 1962	8,100	8	24	...	...	43.0
Caspa/Ermitaño, 1954, 1957	3,500	3	19	...	...	15.0
Campo Yuca, 1958	...	1	4	...	...	32.0
Cantagallo/Yargui, 1943, 1955	6,800-8,700	68	92	...	...	20.0
Carbonera, 1939	...	4	8	...	...	32.0
Caribe, 1970	5,400	3	4	...	...	31.0
Casabe, 1940	3,800	909	1,039	...	...	19.0-22.0
Chunuyaco/Suombios, 1967, 1969	...	6	7	...	...	31.0
Cicuco, 1948	8,600	8	28	...	...	41.0
Colorado, 1925	...	45	76	...	...	34.0
Galan/San Silvestre, 1943	3,200	53	102	...	...	18.0
Garzas, 1957	...	1	2	148,046	2,218,545,000	28.0
Guatiquila, 1985	10,700	2	2	...	...	20.0
Hormiga, 1982	10,300	2	3	...	...	29.0
Infantes, 1918	3,200	305	568	...	...	26.0
La Cira, 1918	3,250	707	951	...	...	23.0
La Cristalina, 1950	10,000	1	8	...	...	30.0
Llanos/Gala/Yuma/Candales, 1955, 1985, 1986, 1988	7,300	60	87	...	...	18.0-25.0

Name of field, discovery date	Depth, ft	No. of wells		1980 average Prod	Cumulative to Dec. 31, 1980 bbl	API gravity
		Producing	Total			
Lisama/Nutria/Tesoro Petrol, 1936, 1966, 1977	9,500	145	219			28.0-32.0
Loro, 19067	10,300	7	12			30.0
Orto, 1948	600-5,200	51	104			25.0-35.0
Ortega, 1951	6,500	5	15			28.0
Palagua, 1954	3,500	96	196			15.0
Peñas Blancas, 1957	...	6	7			23.0
Petrol, 1933	1,200	5	34			46.0
Puerto Barco, 1956	...	...	4			50.0-60.0
Puerto Colon, 1967	9,600	7	10			29.0
Quili, 1958	...	2	3			21.0
Rio de Oro, 1933	1,600-6,500	20	54			32.0-43.0
San Antonio (S. Miguel), 1967	7,820	2	4			28.0
Sarginata Norte/Sur, 1939, 1942	900-4,100	14	39			30.0-52.0
Sucio, 1971	5,500	1	2			31.0
Suna, 1965	10,500	7	8			35.0
Tibu, 1939	4,500-9,300	250	506			32.0-45.0
Toldado, 1967	6,200	6	7			20.0
Other	...	7	71			...
Aguas Blancas, 1962	...	4	7			20.0
Barrancas Lebrja, 1953	6,000	2	11			25.0
Pavas, 1981	...	1	1			21.0
San Luis, Totomai, 1927, 1950	...	2	7			24.0-35.0
Sogamoso, 1958	...	2	4			29.0
Tenerife, 1967	...	1	3			18.0
ESSO COLOMBIANA LTD.						
Aruca, 1980	18,000	3	4	1,443	6,440,075	40.0
Bonanza, 1963	4,000	18	18	677	13,493,912	27.0
Provincia, 1962	8,000	134	172	14,431	172,231,487	29.0
Sabana, 1980	14,000	3	3	259	196,339	29.0
ELF AGRIANE						
Barquerena, 1982	9,300	3	3	886	3,850,549	33.5
Cafio Garza, 1979	7,900	5	5	4,306	3,696,246	33.0
Cafio Garza Norte, 1983	7,900	2	2	917	2,343,808	38.5
Cravo Este, 1987	11,376	...	1	...	108,833	42.0
Cravo Sur, 1982	10,600	2	2	1,490	3,469,581	36.0
La Gloria, 1990	14,000	3	3	1,981	723,178	17.8
Gloria Norte, 1983	12,100	3	3	5,078	3,458,586	18.0
Monchoi, 1984	15,500	1	1	1,586	678,332	30.0
Tierra Blanca, 1987	14,493	1	1	738	398,967	32.0
Tocana, 1980	13,500	2	3	1,273	1,644,521	32.2
Trinidad, 1974	9,000	4	4	6,182	7,347,045	33.0
OCCIDENTAL						
Cafio Limón, 1984	7,600	9	9	28,720	52,116,006	29.0
Cano Yarumal, 1967	7,600	3	4	23,516	13,213,575	29.0
La Yuca, 1964	7,600	34	36	122,339	194,486,422	29.4
Matanegra, 1984	7,600	10	14	24,803	47,664,549	29.7
Redondo, 1984	7,600	4	5	8,574	9,127,491	30.2
TEXACO						
Cocoma, 1963	2,100	45	54	1,885	15,228,678	12.0-13.0
Taquirama, 1963	8,000	5	5	404	5,126,933	16.0-28.0
Velasquez, 1946	7,500	89	100	2,917	168,307,134	19.0-24.0
TEXACO-ECOPETROL						
Los Angeles, 1983	6,400	3	4	538	961,199	14.0-15.0
Nare, 1981	2,100	49	49	3,082	2,048,527	11.0-12.0
Santa Lucia, 1968	9,800	...	3	28	10,159	11.7-26.1
Taca, 1981	2,100	226	239	13,818	35,017,863	12.0-13.0
CHEVRON						
Castilla, 1969	6,500	17	19	13,409	34,324,198	13.5
Chichimene, 1969	6,500	1	2	1,112	1,176,064	21.3
LASMO						
Santiago, 1985	9,600	5	5	5,580	4,102,981	29.0
Total Colombia		3,740	5,387	440,000	3,021,340,279	
CONGO						
AGIP						
Loango, 1972	3,000	52	53	18,150	103,028,300	25.8
Zatchi, 1960	2,000	12	12	7,150	5,457,600	24.7
ELF CONGO						
Bindi, 1982	4,400	1	1	30	153,211	34.2
Emeraude, 1969	820	94	101	17,400	181,916,132	22.3
Kunji, 1980	4,000	2	2	130	581,854	35.8
Likouala, 1972	4,270	27	41	14,400	68,348,251	32.3
Mengo, 1979	6,500	3	3	110	745,525	34.0
Pointe Indienne, 1951	5,000	3	5	140	7,208,572	36.9
Sandji, 1973	3,940	54	80	6,000	75,892,173	29.5
Tchibouala, 1983	2,110	28	30	55,100	46,787,029	27.0
Yanga, 1979	2,950	51	69	16,500	81,335,696	29.4
Total Congo		327	397	135,110	571,464,345	
DENMARK						
DUC						
Dan, 1971	6,000-6,400	41	51	27,247	67,219,243	29.5
Gorm, 1971	6,500-7,000	21	28	24,803	93,111,386	33.9
Rolf, 1981	5,900	1	2	4,669	13,615,011	35.3
Sigold, 1977	5,000	3	7	45,347	65,904,468	30.3
Tyra, 1968	6,500	30	40	18,612	30,924,721	50.4
Total Denmark		96	128	120,678	270,474,831	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells		Production		*API gravity
				Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
DUBAI		DUPETCO ^(e)						
		• Fateh, 1966	7,900-9,000	141	156	406,000	2,317,992,600	31.8
		• S.W. Fateh, 1970	7,500-9,000					30.3
		• Fateh, 1972	8,100					25.5
		• Rashid, 1973	9,400-11,500					38.0
		ARCO						
		Marham, 1981	9,400-11,200	9	16	15,353	40,164,000	43.5
		Total Dubai		150	172	421,353	2,358,156,600	
ECUADOR		TEXACO-PETROECUADOR						
		Atacapi, 1968	9,855	3	5	1,396	13,210,632	31.0
		Auca, 1970	10,578	25	25	15,375	82,356,956	28.0
		Auca Sur, 1980	9,100-10,300	2	2	567	1,840,547	25.6
		Cononaco, 1972	11,233	9	11	12,559	35,326,700	33.3
		Culebra, 1973	10,626	2	2	1,263	3,042,281	17.5
		Dureno/Guanta, 1968	9,575-10,290	8	10	6,918	11,164,033	31.0
		Lago Agno, 1967	10,175	19	33	8,048	117,716,420	28.5
		Parahuacu, 1968	10,173	3	5	1,055	7,157,600	30.0
		Rumiyacu, 1982	10,191	...	1	...	184,936	21.0
		Sacha, 1969	10,160	97	105	63,935	406,809,396	28.0
		Shushufindi/Aguanico, 1959	9,772	51	70	100,087	650,772,391	30.0
		Yuca, 1970	10,423	6	7	3,642	13,685,187	28.0
		Yuca Sur, 1979	9,600-10,000	1	1	224	1,334,172	14.5
		Yulebra, 1980	8,800-10,000	3	3	1,866	4,275,599	21.4
		CICL ^(e)						
		Fanny, 1972	7,700	8	8	...	...	22.5
		Mariann, 1971	7,700	5	5	...	...	20.0
		Tarapoa, 1973	8,300	1	2	...	...	20.0
		CEPE-ORIENT ^(e)						
		Bermejo Sur + Norte, 1967	5,000	21	26	...	...	32.5
		Charapa, 1967	10,000	1	4	...	...	29.5
		Cuyabeno, 1972	8,050	15	19	69,065	262,848,047	27.4
		Libertador	...	44	50	...	...	29.7
		Tetete-Tapi, 1980	9,300	6	11	...	...	29.1
		CEPE-PENINSULA ^(e)						
		Ancon, 1921	4,000	439	439	...	...	35.7
		Carpet	...	99	99	...	...	36.4
		Cautivo	...	79	79	...	...	36.4
		Total Ecuador		947	1,022	286,000	1,813,724,900	
EGYPT		GUPCO/AMOCO						
		Abu Gharadig, 1972	9,500	24	33	9,838	62,282,161	35.0-55.0
		• Badn (315), 1981	6,400	19	30	29,756	78,377,837	27.0
		• El Morgan, 1965	5,100-6,400	99	148	78,200	1,116,222,400	27.0-32.0
		• GH (376), 1981	8,200-9,750	1	5	128	8,199,904	24.0-28.0
		• GS (277), 1980	8,610	1	1	1,168	3,757,952	34.0
		• GS (345/346), 1982	7,500	1	2	314	1,340,653	35.0-38.0
		• GS (365), 1960	10,140	...	1	...	679,175	42.0
		• GS (381), 1985	8,700	...	1	...	1,333,873	37.0
		• GS-327, 1983	5,600	2	1	1,630	3,215,947	20.0
		• Hilal (404), 1982	9,200-10,000	5	9	27,324	67,436,731	32.0
		• July, 1973	8,100-10,000	30	55	56,315	511,229,420	33.0
		• NAG-9/9-1, 1985	10,000	2	2	1,048	2,006,875	35.0
		• NEAG-9/15, 1984	10,635-12,128	2	3	580	1,263,332	35.0
		• Nessim (336), 1981	6,700	1	3	226	8,967,040	29.0
		• October, 1978	11,000	37	42	153,759	445,997,930	27.0-31.0
		• Ramadan, 1974	11,400	23	30	29,909	406,807,025	30.5
		• Razzak and E. Razzak, 1972	5,730-7,710	11	19	2,543	54,221,004	38.0
		• SB (305), 1981	8,100	...	1	...	2,043,837	27.0
		• SB (339), 1981	4,600	1	1	440	999,727	29.5
		• SB (367), 1984	7,500	...	1	...	1,312,941	39.0
		• SB-294, 1986	11,600	2	2	2,536	2,940,429	30.5
		• SB-374, 1981	10,200	...	1	...	68,506	30.0
		• SG-300, 1976	5,720-6,200	2	4	4,583	23,866,801	24.0
		• Shoab Ali, 1978	4,700-5,500	15	49	8,939	85,982,531	28.0-33.0
		• Sidki (382), 1977	10,500	...	...	...	42,761,720	34.0
		• WD-33, 1972	9,700	...	1	...	2,161,591	35.0
		• WD-33/15, 1985	5,800	2	2	1,591	2,853,728	30.0
		• Waly (356), 1982	6,900	1	3	1,832	4,916,962	36.0
		• Younis (347), 1981	4,300	2	6	3,533	16,865,788	32.0
		AGIP						
		Belayim Land, 1953	7,000-8,500	113	122	39,638	465,594,365	21.5
		• Belayim Marine, 1961	8,500	68	78	169,745	723,822,361	29.0
		• Meleha, 1972	5,950	47	53	17,119	22,286,666	41.5
		WEPSCO/PHILLIPS PETROLEUM						
		El Alamein, 1966	8,700	18	19	2,574	66,476,913	34.0
		Umbarka, 1976	10,700	5	6	3,905	9,209,358	44.0
		Yidma, 1971	9,000	4	5	858	22,309,954	43.6
		BADR PETROLEUM/SHELL						
		Badr El Din, 1982	10,800	10	10	21,370	55,000,000	38.0
		Sitra, 1982	...	...	...	548	200,000	40.0
		SUESSO (ESSO)						
		• East Zeit, 1982	11,000	11	11	23,850	30,668,000	39.9
		REPSOL ^(e)						
		Hayat, 1986	9,000	5	5	...	...	40.0
		Khaila, 1983	7,000	6	13	...	...	35.0
		Safir, 1986	12,000	1	1	...	...	36.0
		Safir North, 1986	11,600	3	3	...	...	36.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
	Salam, 1985	8,000	18	29			35.0
	Tut, 1987	9,000	5	5			35.0
	Tut West, 1988	9,000	1	1			35.0
SUCO ^(a)	• Ras Budran, 1978	12,500	17	20			23.0-24.0
	• LL 87-2, 1975	12,000	...	1			34.0
	• Ras Fanar, 1978	3,000	5	6			30.0
	• Zeit Bay, 1981	6,000	22	32			34.5
OSOCO/TOTAL ^(a)	• Shukheir Bay, 1978	6,300	1	1			34.5
	• S. Ramadan, 1982	10,000	2	2			36.5
GEYSUM ^(a)	• Geysum, 1980	5,500	5	5			17.0
EGPC ^(a)	Gharb, 1938	2,200-4,500	81	215			24.3
	Bahr/W. Bahr, 1958/1978	3,200-1,500	48	83			18.0-19.0
	Umei Yusr, 1968	3,000-3,300	19	37			21.5
	Amer, 1965	3,500	21	39			21.5
	El Ayoun, 1968	3,300	5	12	176,201	936,922,600	22.0
	Karaem, 1958	2,300	6	35			16.6
	Kheir, 1973	1,050	1	4			28.5
	Shukheir, 1966	2,500	5	11			34.0
	Ras El Behar, 1983	4,500	6	11			32.5
	Esh Elmalaha	3,700	2	2			44.0
	Sudr, 1946	2,600	12	20			21.8
	Asl, 1947	3,000	3	6			21.8
	Matama, 1948	2,000	2	2			14.6
	El Khalique, 1980	1,600	...	1			29.4
	Abu Senan T&Y, 1981	6,000	12	20			...
	Harghada, 1913	...	...	...			...
EPEDECO ^(a)	West Bahr, 1978	1,300-1,500	20	25			18.0
EGYPTCO ^(a)	Maleha, 1972	6,000	12	12			40.0
SHUKAIR MARINE CO. ^(a)	O. Suco	...	1	1			...
EL ALAMEIN ^(a)	Mors	...	1	1			...
Total Egypt			907	1,421	872,000	5,275,804,037	

FRANCE

ALSACE	All fields	...	13	20	251	3,199,113	...
	Abandoned	...	...	...	...	24,386,362	...
AQUITAINE BASIN	Lacq Supérieur, 1949	2,170	41	71	930	26,552,807	22.3
	Parentis, 1954	7,710	51	105	5,565	201,936,186	33.4
	Lugos, 1956	5,250	18	25	438	10,457,780	20.8
	Cazaux, 1959	7,550	41	72	4,674	72,812,310	34.2/37.3
	Lavergne, 1962	11,480	4	6	310	12,508,313	41.7
	Pécorade, 1974	10,660	6	20	1,534	11,191,168	29.3
	Castéra-Lou, 1976	9,600	7	11	356	2,744,182	21.7
	Vic Brih, 1979	7,100	31	45	3,533	19,369,344	28.6
	Lagrange, 1984	6,500	2	4	5,662	10,084,587	42.5
	Other	...	7	12	185	10,453,873	...
	Abandoned	...	...	...	1	8,849,096	...
PARIS BASIN	Coulommès, 1958	6,230	24	50	358	13,603,710	32.6
	Châteaurenard, 1958	1,800	22	46	352	5,149,717	27.5
	St. Martin de Bossenay, 1959	4,590	9	13	265	8,656,405	33.0
	Villeperdue, 1959	6,100	112	156	10,697	25,316,747	34.4
	St. Firmin-des-Bois, 1960	1,800	32	62	461	10,316,720	27.5
	Chuelles, 1961	1,800	28	66	395	7,279,367	27.5
	Courtenay, 1964	1,800	24	44	465	2,926,026	27.5
	Soudron, 1976	4,600	18	29	371	2,358,398	34.4
	Donnemarie, 1979	8,040	1	6	249	2,287,591	36.2
	Chaunoy, 1983	7,350	55	79	14,372	32,835,649	37.1
	St. Germain, 1984	7,200	9	15	597	2,503,678	36.0
	Champotran, 1985	8,400	9	14	713	1,141,822	31.1
	Donmartin-Lattree, 1985	7,020	4	4	728	851,502	35.0
	Fontaine-au-Bron, 1986	6,140	10	13	1,569	1,936,301	35.4
	L'île du Gord, 1986	7,260	7	9	639	469,140	35.6
	Vert le Grand, 1986	6,230	5	6	2,941	3,492,107	34.8
	Other	...	57	133	2,596	14,683,842	...
	Abandoned	...	...	...	...	11,114,009	...
JURA & SOUTHEAST	All fields abandoned	...	...	...	...	223,063	...
Total France			647	1,138	61,207	561,897,898	

GABON

ELF	• Anguille, 1962	9,200					31.0
	• Anguille NE, 1968	7,500					32.3
	• Anguille SE, 1962	8,200					33.0
	• Ayol Marin, 1978	7,700					19.8
	• Baliste, 1975	4,900					27.5
	• Barber, 1972	6,000					32.6
	• Batanga, 1960	5,900					39.2
	• Baudroie Marine, 1968	7,500					29.7
	• Baudroie N., 1960	7,500					31.5

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
• Brème, 1973	5,000	216	251	104,420	1,021,185,000	37.0
• Clairette, 1956	4,400					32.5
• Dorée, 1972	7,300					30.4
• Girelle, 1973	9,400					31.0
• Gonelle, 1972	5,800					25.7
• Grand-Anguille, 1983	8,400					31.1
• Grondin Marine, 1971	7,500					26.6
• Konzi, 1962	3,600					39.0
• Mandaros, 1972	4,900					20.5
• M'Boumba, 1978	2,800					32.6
• M'Bya Sud, 1969	6,700					36.2
• Mèrou Sardine, 1984	9,900					30.2
• M'Pounié, 1990	6,600					37.0
• M'Pounié W., 1982	1,700					18.0
• N'Tchengué, 1957	4,100					31.0
• N'Tchengué Océan, 1963	6,600					30.2
• Olendé, 1976	6,700					34.0
• Pageau, 1972	11,500					19.8
• Port-Gentil Océan, 1964	6,000					32.2
• Port-Gentil Sud Marine, 1975	7,500					32.1
• Torpille, 1968	8,200					34.0
• Torpille NE, 1982	8,200					32.3
SHELL GABON						
Gamba/Ivinga, 1983	3,000-3,100	51	84	10,137	266,300,000	31.8
Lucina, 1971	5,900	15	22	6,575	56,200,000	38.4
Lucina W., 1982	---	---	---	822	2,600,000	38.4
Rabi, 1985	---	---	---	126,795	68,280,000	34.3
AMOCO						
Oguendo B and C, 1981	5,000-6,000	17	19	8,839	41,315,045	36.0
Oguendo Z, 1988	5,000-6,000	2	2	4,251	1,551,453	36.0
BRITISH GAS						
• Obando, 1984	8,650	2	2	2,315	2,756,929	32.0
• Octopus, 1984	10,300	3	3	937	1,507,997	33.0
• Pelican, 1985	9,300	4	4	5,579	8,040,527	31.0
Total Gabon		310	387	270,670	1,406,736,961	

GHANA

AGRI-PETCO	• Saltpond, 1977	8,500	---	3	---	3,938,000	36.0-39.0
Total Ghana			---	3	---	3,938,000	

GERMANY

BEB	Annaveen, 1963	4,428	---	4	---	500,468	33.8
	Barenburg, 1953	2,300-3,300	42	72	1,900	41,425,209	29.0
	Barver, 1963	3,640	2	5	27	512,667	32.8
	Bodenteich, 1960	4,641	1	2	13	366,374	31.1
	Eich, 1983	5,995	7	8	1,576	2,664,180	38.9
	Elke-West, 1956	6,051	12	16	89	3,666,253	32.8
	Eldingen, 1949	5,028	31	41	631	21,492,847	35.5
	Eisfirth, 1956	5,175	---	8	25	2,869,817	25.7
	Eystrup 2, 1960	3,526	---	1	---	444,778	17.4
	Eystrup 3-6, 1959	1,075	4	4	71	786,196	17.4
	Eystrup-Verden, 1977	3,526	---	4	---	180,333	17.1
	Georgsdorf, 1944	1,800-2,600	198	369	4,700	105,720,831	24.0-29.0
	Gross Lessen, 1969	3,300	6	11	605	21,452,711	30.0
	Hankensbüttel, Mitte, 1954	5,182	6	8	482	13,394,422	33.0
	Hankensbüttel-Nord, 1955	5,182	4	4	341	6,553,584	33.0
	Hankensbüttel, Ost, 1954	5,182	1	1	41	1,304,872	33.0
	Habeleermeer, 1955	3,899	5	15	81	4,579,768	27.3
	Hillense-Nord, 1958	2,683	1	1	14	755,383	31.5
	Hillense-West, 1957	6,077	1	1	2	30,474	43.1
	Hohenasse, 1943	1,705	---	10	7	3,560,505	30.4
	Hohneböstel, 1969	8,341	2	6	40	1,167,064	41.0
	Königsarten, 1984	6,235	3	3	204	322,104	38.1
	Lingen-Dal. (incl. Wd), 1942	3,129	38	128	134	17,059,843	31.1
	Lüben, 1955	3,950	8	10	654	11,115,808	35.0-38.0
	Lüben-West, 1958	4,680	5	6	---	1,586,805	36.9
	Maerdorf, 1954	6,077	11	25	54	1,852,524	43.1
	Meppen-Schwefingen, 1959	4,257	22	24	830	13,121,027	29.8
	Möme-Feldbergen, 1934	1,410	2	2	12	601,597	31.1
	Möme-Wachtel, 1934	3,886	3	9	3	906,440	36.9
	Nienhagen, 1909	3,079	11	26	184	25,284,013	29.6
	Nienhagen-Dachmissen, 1959	3,427	4	8	72	1,072,947	27.8
	Plüfendorf-Ostrach, 1962	3,558	14	23	131	2,622,859	37.7
	Pötrau, 1959	5,248	---	1	---	31,121	14.3
	Rühlermoor-Malm, 1962	4,519	7	10	177	6,806,842	31.7
	Rühlermoor-Valendis, 1949	2,381	242	443	10,801	143,678,244	24.6
	Rühme, 1954	1,950	39	47	650	10,956,472	33.4
	Steimbke-Alt + Nord, 1935	1,246	15	30	67	7,809,501	20.8
	Steimbke-Lichtenmoor, 1943	2,722	14	29	100	4,057,007	17.4
	Steimbke-Ost, 1959	4,428	3	8	49	3,760,584	30.5
	Stockstadt, 1952	5,402	7	21	114	7,791,645	39.6
	Suderbruch, 1949	5,175	42	61	499	23,922,843	31.1
	Sulingen, 1973	3,345	9	9	430	5,510,212	30.0
	Varel, 1957	5,084	5	15	144	5,845,468	25.5

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
MOBIL	Varloh, 1984	4,129	5	6	94	364,085	31.5
	Volkens, 1960	7,540	4	4	71	833,279	22.9
	Wehrbleck, 1957	3,342	46	61	593	17,084,174	32.0
	Wietingsmoor, 1954	2,820	23	29	431	13,545,706	30.5
	Bavaria	5,640-6,190	...	20	...	7,526,952	20.0
	Hannover	980-6,630	51	66	867	31,613,436	25.0-36.0
	Hololding, 1980	11,100	2	3	251	1,196,853	28.0-30.0
	Süd-Oldenburg, 1950	2,630-6,800	71	140	1,033	40,709,444	31.0-39.0
	Voigtei, 1953	980-1,900	74	105	691	25,365,230	32.0-34.0
	Weser Ems	2,000-2,450	20	24	269	6,310,633	24.0
RWE-DEA A.G.	Boostedt, 1952	5,900	24	43	458	18,735,350	32.0
	Hankensbüttel-Sued, 1954	4,900	36	77	1,647	83,873,701	27.0-35.0
	Hardesse, 1957	8,200	29	68	412	9,167,066	40.0
	Hohne, 1951	5,250	28	54	681	41,456,740	33.0
	Leiferde, 1956	2,600	21	42	373	20,660,997	33.0
	Mittelplate, 1987	7,500-9,350	5	6	5,212	5,402,715	19.3
	Oerrel-Sued, 1954	4,600	22	47	570	12,163,739	28.0
	Ploen-Ost, 1958	8,850	29	83	821	51,697,891	33.0
	Prætz, 1962	8,200	18	33	350	11,874,655	28.0
	Schwedeneck-See, 1978	4,900	15	18	6,016	15,319,839	28.0
WINTERSHALL A.G.	Wesendorf, 1943	4,650	14	36	369	17,783,355	25.0-40.0
	Other, 1935	2,300-8,200	14	59	391	31,432,361	19.0-37.0
	Arlingen, 1977	6,232	4	4	772	4,950,082	31.1
	Aldorf, 1952	4,100	29	103	345	17,374,010	33.0
	Arlesried, 1964	4,920-5,550	12	18	414	14,341,477	38.5
	Bockstedt, 1954	4,264	23	48	946	21,542,482	27.4
	Dickel, 1953	3,936	42	50	283	6,929,917	28.3
	Dueste, 1954	3,936	40	71	266	12,347,650	33.0
	Eicklingen, 1937	2,460	9	13	44	3,696,484	30.0
	Emlichheim, 1944	3,116	89	127	3,053	46,612,952	24.5
DST	Hauerz, 1985	8,639	4	4	93	324,589	40.4
	Kirchdorf, 1982	5,737	1	1	13	65,562	38.5
	Lalidau, 1955	3,936	80	87	1,083	27,908,999	36.9
	Maximiliansau, 1959	2,100-5,363	...	...	...	14,367	41.0
	Meckelfeld, 1954	6,396	12	27	220	14,197,039	27.5
	Moenchsrot, 1958	5,248	15	22	270	10,774,384	38.1
	Nienhagen, 1925	3,729	11	12	59	10,967,041	30.0
	Oberschwarzach, 1978	4,920	4	4	85	741,669	37.7
	Pattensen, 1954	2,165	6	7	50	1,096,324	29.3
	Rheinzbarn, 1959	3,750-5,576	1	1	25	36,225	37.9
PREUSSAG	Ruehlertwist, 1949	2,350-2,900	64	132	1,585	32,714,041	25.0
	Rualzheim, 1984	7,544	...	2	...	40,818	37.7
	Schwabmünchen, 1976	4,428	...	1	...	39,491	25.7
	Schwedeneck, 1956	5,182	13	29	145	5,328,026	27.5
	Wathlingen, 1939	2,624	7	10	22	1,429,874	30.0
	Bramberge, 1958	2,560-3,300	64	82	5,284	107,880,083	29.0
	Fronhofen, 1964	3,800	8	13	192	2,481,700	37.0
	Ilmensee, 1967	3,800	2	5	41	1,042,781	37.0
	Markdorf, 1960	7,700	...	2	...	13,912	37.0
	Memmingen-M, 1958	5,000	...	3	...	446,484	37.0
C. DEILMANN AG	Allermöhe, 1979	6,700	1	4	72	444,066	28.0
	Assling, 1961	11,400	2	4	131	8,410,895	30.0
	Broistedt, 1937	2,800	3	17	27	1,354,600	33.0
	Darching, 1967	12,200	2	5	301	5,094,989	39.0
	Eddesse-Nord, 1950	460	31	87	126	5,817,960	26.0
	Höhenrain, 1962	12,900	1	4	23	1,979,337	39.0
	Höver, 1957	2,200	10	16	46	2,215,627	25.0
	Kronsberg, 1953	2,000	14	20	137	2,453,081	25.0
	Lehrte, 1952	4,000	10	23	56	3,231,842	31.0
	Oelheim-Süd/Rhät, 1968	2,000	23	25	604	8,285,714	33.0
EAST GERMANY ^(a)	Reitbrook-Kraide, 1937	2,300	13	159	96	15,872,441	21.0
	Reitbrook-West, 1960	6,100	16	21	410	22,629,809	30.0
	Sinstorf, 1960	7,100	12	23	480	19,662,275	30.0
	Vorhop, 1952	5,000	21	38	794	18,258,502	39.0
	Vorhop-Knesebeck, 1958	4,100	23	35	1,501	20,439,803	35.0
	Adorf, 1948	5,000	28	38	693	8,107,000	28.0
	Humming, 1953	5,000-6,200	27	33	210	2,512,000	25.0-30.0
	Scheerhorn, 1949	3,550-3,750	103	154	2,000	47,198,000	30.0
	All fields	...	...	...	6,000	73,000,000	...
	Total Germany		2,258	4,148	76,551	1,806,416,493	
GREECE							
N. AEGEAN PET. CORP.	Prinos, 1974	8,000-10,000	13	15	16,441	76,373,150	28.5
	Total Greece		13	15	16,441	76,373,150	
GUATEMALA							
MINISTERIO DE ENERGIA Y MINAS	Caribe, 1981	6,830	3	3	853	3,364,493	22.0-24.0
	Rubelsanto, 1974	5,300	5	7	829	6,429,773	26.0-30.0
	San Diego, 1981	17,150	...	...	...	105,753	35.0
	Tierra Blanca	11,230	1	1	1,101	785,054	19.5-23.0

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		1990 average b/d	Cumulative to Dec. 31, 1990 bbl	API gravity
		Producing	Total			
Tortugas, 1973	2,300	...	...	...	67,804	25.0
West Chinaja, 1977	3,200-3,800	3	3	393	7,337,897	31.0-35.0
Xan, 1985	8,427	2	2	682	511,493	17.0
Yalpermech, 1980	15,351	1	1	85	164,982	31.0-35.0
Total Guatemala		15	17	3,943	18,767,249	

HUNGARY

OKGT/NKFV	Algyo, 1965	5,320-8,317	723	1,210	21,593	174,197,625	41.0
	Almosd, 1977	8,143	2	2	1	967	33.8
	Asotthalom, 1967	3,199	15	20	961	10,202,320	32.1
	Battonya, 1959	3,041	17	28	74	1,404,763	39.2
	Battonya East, 1970	2,913	114	126	938	3,848,833	45.4
	Csanadspaca, 1967	6,063	6	6	181	143,849	37.0
	Demen, 1954	725-9,937	193	224	267	9,239,855	38.2
	Ferencszallas, 1969	7,001-7,674	29	52	463	3,054,192	41.1
	Ferencszallas East-Kiszombor, 1973	7,283	13	16	77	3,155,712	41.1
	Fuzesgyarmat, 1974	5,753-5,802	1	1	2	4,805	22.9
	Kaba South, 1978	6,548	3	4	206	709,467	34.1
	Kaszaper South, 1971	5,056	14	14	27	217,316	32.8
	Kelebia NE, 1966	3,113-3,258	4	4	38	1,083,245	37.0
	Kelebia South, 1970	2,428	6	8	257	3,236,223	17.4
	Kiskundorozsma, 1964	4,846-9,711	26	36	1,861	4,093,093	41.9
	Kismana, 1979	2,178-2,536	27	36	71	1,156,456	25.1
	Martfu South, 1979	6,516	8	10	73	26,762	40.0
	Mezohegyes, 1960	3,504-3,589	6	9	64	1,324,674	38.9
	Meziasas, 1978	8,432	3	3	201	79,837	40.0
	Pusztafoldvar, 1958	5,341-5,538	69	107	427	15,411,992	30.2
	Ruzsa, 1979	6,445-9,403	3	3	307	135,788	45.4
	Szeged 1971	8,629	18	25	2,220	23,841,785	41.7
	Szeghalom, 1980	6,545-6,608	42	55	1,152	1,300,200	44.5
	Szolnok, 1953	5,994	3	6	2	1,118,000	30.0
	Totkomos SW, 1966	5,991	4	6	6	378,379	37.0
	Ullas, 1962	5,848-7,464	35	39	5	66,599	36.0
	Other	...	...	...	...	2,895,544	...
OKGT/KFV	Belezna, 1963	8,176	5	31	8	283,054	41.1
	Budala-Kiscsehi, 1936	2,713-4,167	123	514	597	41,570,828	41.1
	Bugac, 1970	4,924	1	5	2	82,963	38.2
	Buzsak, 1954	1,683	...	17	4	234,389	17.4
	Kiskunhalas NE MZ, 1974	5,905	10	34	204	1,794,381	31.2
	Kiskunhalas NE PZ, 1974	6,119-6,594	22	74	864	9,086,012	27.5
	Lovasz, 1940	3,510-4,301	75	479	443	49,828,477	41.3
	Mezocsokonya West, 1987	5,938	...	...	21	9,895	27.5
	Nagyfengyel, 1951	5,545-8,235	71	460	5,004	128,534,063	16.0
	Ortahaza, 1970	4,580-6,089	10	36	117	4,127,416	35.2
	Ortahaza East, 1986	5,413	4	12	57	82,901	31.1
	Pusztasapali, 1973	8,300	2	11	32	1,036,496	22.3
	Szank, 1964	5,827-5,932	22	110	507	16,482,527	38.7
	Szank NW, 1977	5,495	...	...	48	913,598	41.1
	Szank West, 1966	6,106-6,201	1	10	8	19,234	28.7
	Tazlar, 1966	6,365-6,890	2	23	21	393,304	24.0
	Tazlar Nord, 1986	7,129-7,415	1	7	90	43,741	32.5
	Zalakaros-Savoly, 1979	5,463-5,791	6	34	1,112	2,885,329	20.7
	Other	...	...	...	...	7,339,704	...
	Total Hungary		1,739	3,907	40,613	527,067,998	

INDIA

WESTERN	Ankleshwar, 1960	1,969-6,564	124	293	14,676	43,475,676	40-43.0
	Baloi, 1970	1,000-1,100	91	171	3,791	3,923,520	16.0
	Gandhar, 1984	9,846-12,145	39	106	21,154	18,614,760	46.0
	Jhabora, 1976	1,200-1,300	74	108	9,325	30,143,760	24-29.0
	Jofana, 1977	1,100-1,500	44	79	13,154	18,619,600	40.0
	Kadi, N., 1967	3,610-7,220	162	238	11,931	58,940,640	21.0
	Kadi, S., 1968	6,892-9,846	...	39	...	3,812,000	24.0
	Kaloi, 1961	4,595-10,830	203	368	10,628	49,849,200	36-39.0
	Lanwa, 1972	950-1,140	71	105	3,125	2,108,160	15.0
	Motwan and Sisodara, 1974	1,500-1,700	26	62	3,469	17,253,240	48.0
	Niada, 1988	2,800-3,500	3	9	1,265	1,515,240	40.0
	Nawagam, 1963	4,595-10,174	84	133	2,664	27,274,320	35-37.0
	Sanand, 1962	4,267-10,174	...	88	...	10,317,000	26.0
	Santhal, 1971	1,000-1,100	77	147	8,520	31,780,760	17.0
	Sothasan, 1968	4,595-9,846	77	135	12,392	8,322,840	29.0
	Viraj, 1978	4,595-4,923	25	39	2,686	5,731,560	20.0-24.0
EASTERN	Chang Pang, 1973	8,861-10,502	13	20	2,430	5,746,200	...
	Geleki, 1968	9,518-14,769	77	173	6,756	32,617,920	30.0
	Lakha-Lakhmani, 1964	6,564-14,113	222	377	28,877	182,079,440	33.0
	Rudrasagar, 1960	7,877-13,128	47	119	6,178	39,323,040	26.0
	Others	...	21	162	5,175	9,106,080	...
BOMBAY OFFSHORE	B-38 (Heera), 1977	4,267-6,564	45	65	27,999	56,708,040	37.0
	Bombay High, 1974	3,282-7,877	313	507	402,797	1,234,971,800	39.0
	Panna (North Bassein), 1976	4,923-7,549	7	14	2,825	1,895,880	38.0
	Ratna, 1979	7,500	3	10	1,266	9,186,600	38.0
	Others	...	4	5	622	322,080	...

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
SOUTHERN	Adiyakam Mangalam, 1989	2,200	2	4	197	153,720	40-43
	Lingala, 1989	2,100	1	3	205	109,800	40-43
	Narimanam, 1985	6,236-7,549	15	24	5,753	3,769,800	43-45
	Others		1	10	183	175,680	46-52
OTHER FIELDS	Bakrol, 1966	2,626-3,346	...	3	...	37,000	...
	Digboi, 1980	300-7,500	228-468	563	86,361,895	...	...
	Dikom, 1991	3,612	...	...	...	...	...
	Jorajan, 1967	7,000-11,500	130	204	21,659	60,465,535	25.0-34.0
	Kathaloni, 1991	3,552	...	...	...	...	...
	Kathana, 1965	5,250-5,906	...	33	...	5,103,000	25.0
	Kharsang/Ningru, 1976	3,300-5,000	26	39	827	...	...
	Khoka, 1966	5,579-7,877	...	19	...	636,000	...
	Kosamba, 1963	1,313-8,533	...	23	...	978,000	...
	Moran, 1958	11,000	63	91	8,425	112,362,725	...
	Nakhorkatiya, 1953	9,500	196	335	23,065	376,392,725	...
	Waivei, 1962	4,595-7,220	...	...	...	168,000	...
	Total India		2,514	4,828	664,582	2,530,353,236	

INDONESIA

PERTAMINA UEP I	Besitang, 1977	3,973	3	16	21	2,201,000	51.5
	Gebang, 1977	2,917	17	50	447	5,789,900	54.0
	Kuala Simpang Barat, 1971	3,740-5,019	20	36	3,401	22,112,700	45.0
	Kuala Simpang Timur, 1967	...	4	23	22	1,375,300	...
	P. Tabuhan Barat, 1937	3,350-5,893	19	32	524	7,052,900	50.8
	P. Tabuhan Timur, 1968	...	31	113	647	20,355,000	...
	Rantau, 1929	2,764	84	492	3,873	241,067,800	45.3
	Serang Jaya, 1926	3,701	20	79	313	3,868,800	47.6
	Sungai Buluh, 1984	3,701	5	8	266	1,395,300	...
	Kuala Dairam, 1983	...	16	19	596	1,728,900	...
	Pulau Panjang, 1928	...	...	64	2	14,653,000	...
	Securai, 1980	...	7	14	334	11,191,600	...
PERTAMINA UEP II	Azab, 1951	6,000	17	95	388	38,872,800	36.0
	Banakat, 1932	1,600	61	206	1,511	134,833,000	35.0
	Jinak, 1930	2,300	35	155	339	51,983,000	35.0
	Talang Akar, 1922	2,800	26	344	749	347,232,800	35.0
	Deras, 1937	...	2	4	79	1,648,100	...
	Derwa, 1936	...	9	32	65	8,719,500	...
	Belun, 1935	...	2	8	147	6,008,300	...
	Candi, 1937	...	2	2	31	169,900	...
	Kruh N., 1935	...	1	6	9	315,700	...
	Raja, 1950	6,000	20	101	1,352	32,418,300	38.0
	Sukaraja, 1934	...	...	...	43	1,474,600	...
	Bajubang, 1930	...	17	111	321	41,076,500	...
	Betung Jambi, 1951	...	9	201	95	2,562,600	...
	Kenali Asam, 1931	2,077	60	163	1,185	94,360,200	29.0
	Ketaling Timur, 1982	...	8	10	227	163,200	...
	Senti, 1960	...	7	20	169	2,766,200	...
	Sungai Gelam, 1958	...	1	7	55	215,700	...
	Sungai Lili, 1964	...	23	27	685	3,852,900	...
	Tempino, 1931	1,647	47	161	941	86,972,300	23.0
	Belimbing, 1965	5,371	7	29	758	21,388,200	...
	Benakat East, 1973	...	27	52	1,083	17,628,400	...
	Benuang, 1942	6,103	33	46	377	7,901,800	35.1
	Gn. Kemala, 1938	5,448	20	76	1,405	28,260,900	38.0
	Kuang, 1940	5,249	6	16	369	7,389,500	25.1
	Limau, 1928	3,896-4,626	58	261	1,603	189,227,100	...
	Ogan Timur, 1943	3,793	11	28	377	4,211,200	27.4
	T. Mining, 1935	640	25	47	1,101	12,183,500	...
	Talang Jimar, 1937	4,123	35	304	1,201	172,160,700	31.0
	Tanjung Tiga, 1938	3,750	37	107	977	58,261,700	28.0
	Karangan, 1975	...	...	...	84	1,027,200	23.0
	Beringin, 1975	...	...	...	921	420,900	...
	Betung, 1966	...	...	...	245	750,000	...
	Limau Niru, 1954	...	...	...	747	25,262,300	...
	Musi, 1985	...	...	...	1,007	1,913,500	...
	Prabumulih Barat, 1953	...	...	...	164	11,180,700	...
	Air Serdang, 1988	...	...	...	150	195,100	...
	Andan, 1950	...	3	8	107	5,602,900	...
	Bilbing, 1952	...	2	3	15	716,100	...
	Ukui/Pondok, 1950	...	5	9	104	5,246,500	...
	Link, 1939	1,600	33	46	1,109	38,955,900	34.0
	Molek, 1956	2,600	13	27	209	11,877,100	34.0
	N. Pulau, 1941	1,800	15	39	343	37,450,000	34.0
	S. Pulau, 1941	1,800	12	17	208	5,101,700	34.0
	Sago, 1940	1,800	61	84	2,905	124,512,400	34.0
PERTAMINA UEP III	Cemara, 1976	3,964-7,104	19	34	625	6,101,200	...
	Jatibarang, 1969	3,053	88	141	3,318	68,931,400	29.0
	Tugu Barat, 1979	3,014	13	22	1,532	5,500,000	...
	Kandang Haur Timur, 1979	...	4	8	41	1,266,200	...
	MB STR, 1985	...	15	15	5,180	7,490,400	...
	Pegaden, 1986	...	1	2	66	90,900	...
	Randegan, 1973	...	4	11	53	546,000	...

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		*API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
	Karwegan, 1926	...	...	...	2,086	87,044,900	...
	Ladok, 1893	...	...	...	118	25,207,900	...
	Ngiobo, 1896	...	...	...	236	5,359,800	...
	Semanggi, 1896	...	...	...	34	5,446,300	...
PERTAMINA UEP IV	Bunyu Nibung, 1923	2,077	40	106	2,663	83,321,300	33.2
	Sembakung, 1976	2,600	16	17	3,108	229,600	36.0
	Tapa-Tentip, 1975	...	10	20	244	471,700	...
	Bangkadula, 1960	3,250	1	1	12	548,500	39.5
	Sakimah	...	1	2	38	320,300	...
	Sangatta, 1939	1,842	39	95	2,492	22,770,100	33.0
	Tanjung, 1938	2,296	57	85	1,482	103,545,800	39.9
	Tapian Timur, 1967	4,396	11	20	577	5,860,600	38.8
	Warukin, 1966	2,067	22	31	741	10,862,800	28.9
	Dahor Selatan, 1966	...	2	2	50	50,900	...
	Tanta, 1975	...	1	1	8	6,900	...
	Kambitin, 1981	3,491	2	8	90	246,000	...
PERTAMINA UEP V	Klamono, 1936	574	53	67	967	35,616,500	19.0
	Linda, 1977	3,281	10	16	426	1,154,100	19.0
	Salewati, 1977	...	7	16	879	29,142,900	...
	Seie, 1951	2,156	7	16	172	1,547,500	35.0
TOTAL CFP	• Bekapai, 1972	4,600-15,600	42	45	9,671	163,700,000	40.0
	• Handil, 1974	2,900-19,200	230	280	62,479	700,104,900	33.0
	• Tambora, 1980	8,000-13,000	16	36	574	12,190,600	33.0
	Tunu ^(C) , 1985	8,001-13,000	5	26	1,474	536,000	55.0
ARCO	Ardjuna, 1969	2,380-7,250	333	387	91,145	750,505,000	37.0
	Anmbi, 1972	2,943	29	33	8,370	33,086,000	33.0
	Bima, 1983	3,000-3,888	55	59	9,200	19,254,000	34.0
	NWC, 1974	5,411-5,800	29	36	9,378	10,465,000	31.5
KODECO ENERGY	Madura, 1975	...	5	14	980	3,816,600	...
AMOSEAS	Anoa, 1984	...	9	9	2,299	839,000	...
AGL PETROLEUM (SERAM) LTD.	Bula, 1997	280-1,300	75	355	1,258	15,978,000	23.0
CHEVRON & TEXACO	Batang, 1975	690	11	13	795	2,607,000	19.0
	Benua, 1978	2,400	21	25	10,025	24,686,300	37.0
	Beruk, 1974	1,750	21	28	12,934	55,632,200	38.0
	Beruk NE, 1978	1,800	3	6	55	1,786,500	40.0
	Beruk North, 1985	1,900	6	7	1,548	1,381,700	38.0
	Buaya, 1978	2,035	...	2	...	191,000	28.0
	Bungsu, 1976	2,050	7	8	701	11,625,200	38.0
	Butun, 1982	4,000	9	9	19,351	9,173,000	44.0
	Damar, 1974	4,650	5	6	471	4,950,900	34.0
	Dusun, 1979	2,550	6	7	732	5,979,300	42.0
	Gatam, 1977	2,385	...	3	...	627,200	34.0
	Idris, 1983	2,450	1	3	400	916,100	39.0
	Jingga, 1984	6,500	3	3	1,702	1,204,400	45.0
	Kasikan, 1972	660	22	29	1,189	6,954,600	28.0
	Langgak, 1976	1,380	26	26	2,263	6,396,600	32.0
	Linda, 1971	1,100	18	20	1,165	7,566,300	32.0
	Menggala S., 1968	3,765	2	2	673	16,187,700	34.0
	Mengkapen, 1981	4,000	1	1	301	1,139,900	44.0
	Osam, 1978	900	6	7	203	1,062,900	32.0
	Paitan, 1978	2,315	1	1	164	864,100	32.0
	Pedada, 1973	950	30	31	11,345	77,118,200	33.0
	Pusaka, 1977	2,250	20	25	7,575	17,421,200	36.0
	Rintis, 1984	6,450	1	1	265	237,800	39.7
	Sabak, 1974	2,350	16	17	1,408	19,612,000	36.0
	Tanjung Medan, 1976	2,770	2	7	678	2,578,600	34.0
	Terantam, 1973	900	4	6	304	866,500	32.0
	Zamrud, 1975	3,600	52	55	19,299	78,986,600	40.0
	Ujung Tanjung, 1975	3,600	1	3	270	98,500	34.0
	Pak, 1988	3,667	2	2	315	114,900	35.0
CALTEX PACIFIC INDONESIA	Ampuh, 1981	6,000	10	14	2,142	3,042,000	38.0
	Antara, 1978	1,425	5	6	916	4,242,500	36.0
	Baiam S., 1969	1,600	59	62	9,178	105,158,600	33.0
	Baiam SE, 1972	4,500	13	13	618	7,112,500	29.0
	Bangko, 1970	1,950	86	97	27,223	366,499,300	34.0
	Batang CPI, 1975	690	7	7	608	1,363,000	19.0
	Bekasap, 1955	2,950	52	68	16,563	419,807,600	34.0
	Bekasap South, 1966	3,900	6	14	844	27,822,900	34.0
	Benar, 1973	2,450	28	34	4,178	60,600,100	33.0
	Cebakan, 1974	4,700	4	5	520	4,643,900	30.0
	Aman, 1974	4,700	10	10	1,272	27,546,100	39.0
	Cucut, 1981	5,800	2	3	403	279,200	33.0
	Duri, 1941	770	1,558	2,042	165,200	581,682,000	22.0
	Giaruk, 1980	4,600	...	2	...	119,200	31.0
	Hitam, 1975	6,690	4	5	1,011	2,755,800	39.0
	Flu, 1983	5,900	3	4	1,074	1,124,600	40.0
	Intan, 1977	3,350	6	7	1,427	7,843,000	33.0
	Jorang, 1972	5,500	17	21	9,345	43,636,300	38.0
	Kerang, 1977	3,900	11	14	1,922	6,840,400	39.0

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
Kopar, 1974	5,300	12	24	4,381	15,400,000	37.0
Kotabatak, 1952	5,500	88	141	20,096	150,559,000	29.0
Kulin, 1970	2,050	63	71	5,501	35,355,800	20.9
Libo, 1968	6,000	2	12	830	7,025,000	35.0
Libo SE, 1973	5,900	22	29	8,096	7,909,300	42.0
Lincak, 1981	2,570	4	4	288	2,984,300	35.0
Menggala N., 1968	3,850	18	22	3,928	67,028,900	33.0
Menggala S. CPI, 1968	3,765	6	9	1,299	32,808,900	34.0
Minas, 1944	2,600	460	627	284,701	3,521,083,800	35.0
Mindal, 1971	3,400	2	5	41	3,119,900	37.0
Mutiara, 1976	3,500	2	2	9	1,901,300	34.0
Nela, 1977	5,000	3	5	33	870,100	35.0
Obor, 1978	7,370	2	4	543	2,534,500	40.0
Pager, 1974	4,300	25	28	6,506	80,812,800	38.0
Pelita, 1977	6,600	4	7	820	4,771,200	39.0
Pematang, 1959	3,750	34	46	7,432	224,473,500	32.0
Pematang Bow, 1969	5,300	11	19	1,934	8,600,800	33.0
Pemburu, 1981	2,300	10	11	2,778	11,177,300	35.0
Perkebunan, 1977	2,300	1	1	168	379,400	29.0
Petani, 1964	4,750	35	38	11,493	282,054,200	33.0
Petapahan, 1971	4,500	21	32	4,529	96,200,100	28.0
Pinang, 1971	3,950	18	22	3,796	28,861,600	30.0
Pinggir, 1972	3,300	3	7	170	4,604,800	35.0
Pinggir S., 1973	3,300	2	4	62	2,071,500	39.0
Pudu, 1972	5,950	7	13	1,406	29,040,100	35.0
Puncak, 1979	2,400	15	18	2,956	16,288,200	36.0
Pungut, 1951	3,400	26	34	4,193	49,582,600	38.0
Rangau, 1968	6,100	3	13	345	8,536,000	42.0
Rantaubasis, 1972	1,070	14	18	524	1,037,400	18.0
Rokin, 1979	6,100	1	4	523	1,022,800	41.0
Mangaa, 1988	7,800	1	1	345	126,000	34.0
Seruni, 1972	3,000	23	25	7,059	50,193,700	35.0
Sikladi, 1975	4,340	19	21	2,219	21,100,200	40.0
Singa, 1977	3,200	1	2	...	437,000	31.0
Sintong, 1971	3,400	24	25	2,733	56,929,500	32.0
Sintong SE, 1973	4,500	1	1	85	1,230,100	36.0
Suram, 1971	1,750	3	7	284	3,824,500	28.0
Tandun, 1969	3,000	12	13	2,184	14,416,000	33.0
Telings, 1975	4,205	7	10	625	3,786,600	33.0
Topaz, 1977	5,200	7	8	1,807	17,743,500	33.0
Topi, 1979	3,630	1	1	88	598,600	37.0
Tunas, 1983	4,819	2	2	279	399,100	35.0
Ubi, 1978	4,350	24	25	2,557	14,931,300	35.0
Waduk, 1982	6,100	9	13	135	4,860,300	38.0
Tanggul, 1977	3,700	2	2	436	159,400	30.0
ASAMERA (NORTH SUMATRA)						
Alur Cimon, 1972	3,098	...	34	...	4,379,000	50.8
Geudondong, 1965	3,182	...	32	...	5,200,000	23.1
Iee Tabau, 1971	2,721	2	73	16	11,904,400	50.3
Julu Rayau, 1968	2,832	7	65	282	12,425,500	53.6
Peudawa, 1980	3,083	...	30	...	1,567,400	48.1
Tualang, 1973	2,631	11	75	1,033	30,900,700	49.9
ASAMERA (SOUTH SUMATRA)						
Bentayan, 1932	4,446	15	24	2,285	2,391,200	22.0
Ken, 1985	3,957	2	3	80	108,200	41.5
Kluang, 1913	2,591	25	54	505	34,224,500	42.6
Mangunjaya, 1934	2,700	5	100	173	23,145,900	32.0
Paneroikan, 1976	4,915	2	8	23	206,800	39.4
Ramba, 1982	3,150	62	78	13,001	55,329,000	37.0
Rawa, 1985	4,038	22	41	6,885	8,506,300	38.7
South Rawa, 1985	4,086	2	3	165	178,200	37.0
Supet, 1984	4,626	10	12	1,955	998,000	33.6
Tanjung Laban, 1982	3,590	21	30	885	6,887,300	38.1
Tempino, 1931	4,493	3	192	148	1,457,400	40.9
MAXUS ENERGY						
• Cinta, 1970	3,500	45	80	16,118	186,121,000	34.0
• Duma, 1983	2,300	2	6	49	765,000	24.0
• Fanda, 1982	8,000	11	22	3,019	13,957,000	32.0
• Gita, 1972	5,000	5	9	529	7,925,000	34.5
• Intan, 1989	5,000	15	16	32,868	18,534,000	32.6
• Karmila, 1983	4,800	4	8	4,532	33,972,000	36.0
• Kitty, 1973	2,700	6	8	1,159	14,805,000	38.0
• Krisna, 1979	4,500	23	43	6,614	64,631,000	37.0
• Nors, 1973	3,200	3	5	482	8,138,000	29.0
• Rama, 1974	3,200	32	73	6,296	95,856,000	31.0
• Selatan, 1971	4,000	7	19	808	21,468,000	19.0
• Sundari, 1982	4,400	9	15	1,767	12,471,000	25.0
• Titi, 1982	8,000	...	5	...	1,656,000	33.0
• Wanda, 1984	4,800	1	5	38	1,651,000	36.0
• Yvonne, 1980	4,500	8	11	2,792	14,744,000	36.0
• Zelda, 1971	7,500	23	47	6,277	41,457,000	33.0
• Intan NE, 1989	5,000	6	6	104	38,000	32.6
• Widuri, 1989	5,000	30	35	10,951	3,997,000	24.0
PETROMER TREND						
Cendrawasih, 1976	3,500	16	27	1,232	13,310,800	26.7
Jaya, 1973	3,050	13	21	1,009	36,547,200	39.7

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		1990 average b/d	Production Cumulative to Dec. 31, 1990 bbl	API gravity
			Producing	Total			
STANVAC (CENTRAL SUMATRA)	Kasim, 1972	3,350	40	57	2,762	49,518,200	36.5
	Kasim Barat, 1975	4,412	1	7	139	3,040,700	33.3
	Kasim Utara, 1975	5,058	3	11	182	8,335,300	26.4
	Klasera, 1981	2,900	...	...	...	25,300	32.5
	Moi, 1979	4,731	4	8	166	799,700	19.4
	Walio, 1975	2,750	247	297	12,690	161,564,800	34.3
	Binio, 1972	1,600	13	37	342	12,101,000	34.0
	E. Kayuara, 1983	3,500	45	64	3,167	9,670,000	35.0
	Gemuruh, 1983	2,800	16	22	1,121	3,150,000	34.0
	K. Ara, 1980	3,944	7	18	268	2,249,000	35.4
STANVAC (SOUTH SUMATRA)	Kerumutan, 1960	3,000	11	42	611	5,623,000	35.0
	Merbau, 1979	2,700	30	47	998	7,496,000	36.0
	Mutiara, 1985	2,700	2	2	44	148,000	34.0
	N. Merbau, 1980	2,600	6	17	345	3,063,000	36.0
	Panduk, 1981	2,500	6	12	219	1,689,000	46.0
	Parum, 1987	4,200	16	23	2,449	2,278,000	35.0
	Pekan, 1976	3,700	13	48	414	8,135,000	35.0
	Gunung Kembang, 1979	4,000	3	6	274	117,000	36.0
	Ibul, 1970	5,700	16	54	619	22,420,000	36.0
	Jenis, 1985	6,500	24	47	17,178	27,178,080	35.0
VIRGINIA INDONESIA	• Kerang (PSC), 1984	2,900	4	7	466	1,344,000	35.0
	Lagan, 1986	2,400	5	8	236	380,000	56.8
	Pian, 1986	6,000	4	10	499	279,000	36.0
	Rambutan, 1972	4,500	6	24	99	3,225,000	42.0
	Rimbabat (PSC), 1984	3,200	3	4	110	204,000	34.0
	S. Tabuan, 1980	3,000	1	5	27	45,000	...
	• Tabuan (PSC)	4,000	6	11	548	1,977,000	34.0
	Teras, 1951	3,000	3	4	121	833,000	37.0
	Badak, 1972	5,190-10,600	135	168	13,151	83,400,000	34.4
	Mutiara, 1984	900-5,800	8	38	3,014	6,100,000	36.5
UNOCAL	Nilam, 1974	7,500-11,500	90	115	15,890	42,200,000	33.4
	Pamaguan, 1974	900-5,100	14	32	1,644	8,000,000	26.8
	Semberah, 1974	2,900-10,100	...	38	...	565,000	30.0
	Wailan, 1974	5,000-6,000	6	6	6	46,200	32.0
	• Attaka, 1970	7,500	90	121	50,978	503,615,000	39.0
	• Kemendingan, 1972	7,000	...	14	...	5,034,000	23.8
	• Melahin, 1972	7,500	4	9	732	7,054,000	23.1
	• Rajah, 1981	5,500	...	...	...	...	33.8
	• Sepinggan, 1973	11,150	34	39	18,592	58,232,000	34.0
	• Yakin, 1976	5,100	20	38	5,495	25,617,000	18.8
CONOCO GROUP	• Ikan Pan, 1983	4,500	4	4	6,200	3,052,700	47.0
	• Kepiting, 1982	6,000	...	2	...	2,563,200	37.0
	• Udang, 1974	5,595	17	28	3,468	61,367,000	40.0
	Winagar, 1984	3,500	3	3	2,575	939,700	39.7
MOBIL OIL	Arun ⁽¹⁾ , 1971	10,050	54	89	121,392	425,500,000	55.0
MARATHON	• Kakap KH, 1980	8,500	8	8	5,260	17,489,000	45.0
	• Kakap KF, 1984	8,100	14	14	27,041	9,923,700	49.0
HUBBARD (MALACCA STRAIT)	• Kurau, 1986	4,500-9,000	20	22	26,259	22,484,700	47.4
	• Lalang, 1980	3,100-3,600	11	18	5,531	38,418,800	39.6
	• Melbur, 1984	900-1,300	17	25	8,042	12,035,500	35.6
	• Mengkapan, 1981	3,850-4,450	9	10	6,044	22,706,200	42.0
	Selatan, 1987	3,900-4,500	8	14	207	455,700	...
TESORO INDONESIA PETROLEUM	Samboja, 1909	360-4,380	26	99	2,263	266,376,000	25.0
	Sanga Sanga, 1897	275-6,000	108	244	1,959	192,593,000	31.0
	Tarakan, 1906	200-6,540	122	1,167	922	74,678,000	19.0
	Tarakan (Mamburungan field), 1984	5,020-5,131	2	4	537	285,000	31.1
Total Indonesia			7,262	14,588	1,408,725	14,143,534,380	

IRAN

NIOC	• Aboozar, 1969	2,800	...	...	...	27.0
	Agha Jan, 1936	7,440	58	89	...	34.0
• Ahwaz Asman, 1958	Ahwaz Asman, 1958	8,150	73	85	...	32.0
	Ahwaz Bagestan, 1958	12,000	...	7	...	24.3
• Bahregansar, 1960	Bahregansar, 1960	9,000	...	...	...	30.0
	Bibi Hakimeh, 1961	4,570	19	33	...	29.9
• Binak, 1959	Binak, 1959	10,440	...	4	...	29.9
	Chesme Khush, 1967	10,700	...	4	...	27.7
• Chilingar, 1974	Chilingar, 1974	3,350	...	1	...	39.3
	Cyrus, 1962	7,000	...	...	...	18.3
• Darius, 1961	Darius, 1961	11,000	...	...	...	34.0
	Dehloran, 1972	11,900	...	6	...	31.0
• Forozan, 1966	Forozan, 1966	7,000	...	...	...	28.5
	Gachsaran, 1937	3,400	46	62	...	31.0
• Haft Kel, 1927	Haft Kel, 1927	1,980	2	11	...	37.7
	Hendiyan, 1968	11,000	...	...	...	23.0
• Karanji, 1963	Karanji, 1963	5,360	7	7	...	33.9
	Khang, 1961	10,900	...	...	...	31.6
• Kupal, 1965	Kupal, 1965	10,500	...	7	...	32.8
	Lab-e Safid, 1968	4,350	...	7	3,252,000	35.3
					39,179,417,094	

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		*API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
	Mansuri, 1963	7,100	4	8			28.4
	Marun, 1963	9,400	55	112			32.6
	Masjid-e Suleiman, 1908	1,600	7	24			39.3
	Naft Safid, 1938	5,000	5	19			36.8
	Naft-Shahre, 1923	2,000-3,000	...	...			43.0
	* Nowruz, 1966	8,200	...	...			21.0
	Par-e Siah, 1964	4,250	...	1			37.7
	Paris, 1964	4,670	22	27			38.8
	Pazanan, 1961	7,250	44	71			37.2
	Rag-e Sefid, 1964	7,230	19	29			28.6
	Ramin, 1966	12,200	...	...			32.9
	Ramshir, 1962	8,750	...	3			27.6
	* Resalat, 1969	7,650	...	...			35.8
	* Reshadat, 1966	7,000	...	...			34.4
	* Salman, 1965	7,500-8,100	...	...			34.0
	Shadegan, 1989	...	...	...			...
	Sorush, 1962	7,000	...	...			18.3
	Sulabedar, 1971	3,400	...	...			30.4
	Total Iran		361	618	3,252,000	36,179,417,084	
IRAQ(*)	INOC						
	Abu Ghurab, 1971	9,800	12	16			24.0
	Ain Zalah, 1939	5,200-6,500	15	28			31.0
	Bai Hassan, 1953	4,800-5,400	56	84			34.0
	Balad, 1983	6,000-7,000	4	8			25.0
	Butmah, 1953	3,900	1	17			31.0
	Buzurgan, 1970	12,000	20	22			24.0
	East Baghdad, 1975	6,000-7,000	32	79			23.0
	Hamm, 1973	2,000	...	14			30.0
	Jabal Fauqi, 1974	10,000	20	23			25.5
	Jambur, 1954	5,500-12,500	27	50	2,080,000	22,430,413,000	38.0
	Kirkuk, 1927	2,800-4,200	71	269			36.0
	Luhais, 1961	8,200	12	21			33.0
	Naft Khanah, 1909	3,500	7	11			42.5
	Nahr Umar, 1949	8,200	5	13			42.0
	Qaiyana, 1929	650	33	50			16.0
	Rumaila North, 1958	10,300	303	443			33.0
	Rumaila South, 1953	10,200	133	208			34.0
	Suffayah, 1978	3,900	11	39			25.0
	West Tikrit, 1969	8,200	2	6			23.0
	Zubeir, 1949	10,200	56	110			36.0
	Total Iraq		*820	1,511	2,080,000	22,430,413,000	
ISRAEL(*)	LAPIDOTH						
	Heletz-Brur, 1955	5,200	4	18			29.2
	Kochav, 1962	5,500	6	13			27.9
	OEIL						
	Ashdod, 1976	8,400	2	2	249	17,010,100	32.5
	EMOG						
	Gurin, 1984	3,280	...	...			17.0
	Total Israel		12	33	249	17,010,100	
ITALY	ELF						
	* Rospo Mare, 1975	4,600	19	20	27,673	34,658,319	12.2
	* Santa Maria a Mare, 1974	7,900	8	9	720	18,256,871	22.3
	* Sarago Mare, 1979	5,200	4	6	3,771	12,715,186	8.1
	AGIP						
	Benevento, 1974	10,355	1	1	669	644,000	39.0
	Cammarata/Pozzillo, 1959	10,499	4	4	108	1,646,000	8.3
	Cavone, 1973	9,350	10	14	2,700	9,873,000	21.5
	Cotemaggiore, 1949	6,562	3	5	111	7,707,000	33.2
	Costamolina, 1983	12,795	1	1	92	34,000	17.8
	* Emilio, 1971	8,530	1	1	411	649,000	10.7
	Gaggiano, 1982	14,764	2	2	328	563,000	37.2
	Gela, 1956	10,827	63	85	8,162	121,618,000	10.0
	Glaurone, 1962	10,170	2	5	169	63,000	10.2
	Malossa, 1973	17,060	2	4	340	26,262,000	52.9
	Monte Alpi, 1968	11,483	1	2	23	108,000	37.2
	* Perla, 1976	7,874	3	4	53	1,956,000	13.3
	Prestici-S. Cataldo, 1960	6,980	8	11	1,206	8,763,000	12.0
	Ponte-Dinillo, 1959	9,514	9	11	1,865	12,483,000	15.8
	* Prezioso, 1982	15,748	6	8	4,623	3,024,000	19.7
	Ragusa, 1953	4,593	37	39	4,044	131,032,000	19.3
	S. Maria Inbaro, 1963	7,545	3	3	319	480,000	15.9
	Torrente Tona, 1963	4,101	8	13	933	2,988,000	31.9
	V. Fortuna, 1984	18,044	5	12	11,916	9,614,000	46.3
	SALM						
	Vega, 1980	8,500	20	24	13,240	24,930,178	18.0
	Total Italy		222	284	83,466	430,067,554	
IVORY COAST(*)	SIOP						
	* Belier, 1975	6,500-7,000	13	18			34.5
	PETROCI						
	* Espoir, 1980	6,500-11,000	...	...	2,000	50,224,071	32.3
	Total Ivory Coast		13	18	2,000	50,224,071	

		Production					
		1990		Cumulative to		*API	
		average		Dec. 31, 1990		gravity	
		b/d		mbl			
Name of field, discovery date		Depth, ft		Producing Total			

*Prior to the conflict in the Persian Gulf.

WORLDWIDE PRODUCTION

		Production		1990 average b/d	Cumulative to Dec. 31, 1990 bbl	API gravity	
Name of field, discovery date		Depth, ft	No. of wells Producing Total				
MALAYSIA							
ESSO MALAYSIA	• Bekok, 1975	5,500	22	33	330,000	940,000,000	47.0
	• Guntong, 1978	5,200	56	91			44.0
	• Irong Barat, 1979	3,300	9	16			36.0
	• Kapong, 1979	6,000	...	11			47.0
	• Palas, 1979	6,300	13	16			49.0
	• Pulas, 1973	4,300	22	32			42.3
	• Seligi, 1971	4,300	40	43			50.0
	• Semangkok, 1980	3,700	31	41			42.5
	• Tabu, 1976	5,800	15	24			44.0
	• Tapu, 1975	6,700	41	80			45.0
	• Tinggi, 1980	4,400	21	27			48.0
	• Tong, 1978	5,800	29	41			47.0
SABAH SHELL PETROLEUM (SBPC)	• Barion, 1971	2,400	4	4	10,411	16,400,000	37.0
	• Erb West, 1971	6,785	15	19	22,486	43,900,000	30.0
	• Katam, 1977	4,800	1	4	274	1,300,000	30.0
	• Samarang, 1972	5,700	56	80	46,027	286,300,000	37.0
	• South Furios, 1974	3,300	7	15	4,384	16,300,000	30.0
	• St. Joseph, 1975	2,200	11	14	37,534	47,000,000	32.0
SARAWAK SHELL BERHAD (SSB)	• Bayan, 1976	4,200	7	9	24,932	41,100,000	37.3
	• D-16, 1981	4,000	5	5	2,466	4,900,000	39.9
	• Temans, 1972	3,100	19	29	13,151	49,300,000	35.0
PETRONAS CARIGALI ^(e)	• Tembungo, 1971	6,000	8	16	131,355	625,126,800	40.0
SARAWAK SHELL/PETRONAS CAG ^(e)	• Bakau	...	...	...			...
	• Beram	...	...	...			...
	• Baronia, 1967	7,900	19	40			42.0
	• Betty, 1967	7,900	13	17			38.0
	• Bokor, 1972	2,000	18	19			35.0
	• Fairley Beram, 1973	6,655	...	2			36.5
	• Siwa, 1973	4,100	4	4			25.0
	• Tulus, 1966	5,000	26	46			29.2
	• West Lutong	...	...	...			38.5
	Total Malaysia			503			784	623,080	2,080,626,600
MEXICO							
NORTH ZONE, FRONTERA NE	Misión, 1945	5,440	173	...	...	...	42.4
	Monterrey, 1950	6,510					...
	Tigüilo, 1971	3,342					...
	Cañon	...					...
	Comitas	...					...
NORTH ZONE, ALTAMIRA	Arenque, 1970	11,362	25,254	...	...	...	36.0
	Constituciones, 1956	6,350					17.0
	Ebano-Pánuco, 1901	1,450					12.0
	Tamaulipas	4,200					19.0
NORTH ZONE, CERRO AZUL	Chicontepec, 1973	4,264	16,893	...	...	...	...
	• Isla de Lobos, 1963	6,875					34.1
	• Maricopa, 1974	10,196					40.0
	Naranjos-C. Azul, 1909	1,900					34.0
	Tres Hermanos, 1959	6,960					27.0
	...	...					...
NORTH ZONE, POZA RICA	• Anán, 1966	9,040	50,530	...	...	...	37.0
	• Bagre, 1973	10,919					33.0
	Escobón, 1942	7,216					26.3
	Hallazgo, 1955	10,170					28.7
	Jilapa, 1958	7,390					35.6
	Mecatepec, 1941	7,544					29.8
	Miquetia, 1959	6,480					29.8
	Poza Rica, 1930	7,090					35.0
	Pres. Alemán, 1949	8,036					24.0
	Ramolino, 1962	10,745					29.5
NORTH ZONE, FAJA DE ORO	San Andrés, 1956	10,410	...	...	...	...	29.0
	Acuatempa, 1955	4,085					21.0
	Muro, 1955	3,966					17.0
	Ordóñez, 1952	5,220					21.6
	Ocoitepec, 1953	3,737					20.9
	Santa Agueda, 1953	4,780					18.0
NORTH ZONE, VERACRUZ	Matapionche, 1974	11,129	5,384	...	...	...	...
	Angostura	...					36.9
	Copile	...					14.0
	Other	...					32.3
SOUTH ZONE, NANCHITAL	Inhuastlán Ota, 1965	1,960	...	...	...	...	20.4
	Molacón, 1962	500					22.0
	Santa Rosa, 1952	1,312					25.4
SOUTH ZONE, AGUA DULCE	Agata, 1966	3,630	61,519	...	...	...	34.6
	Bacal, 1976	3,500					36.0
	Blasillo, 1967	7,216					37.0
	Cinco Pías, 1960	6,862					32.0
	Consejo, 1974	1,600					32.7
	Cuchapa, 1935	2,200					30.0
	El Plan, 1931	1,700					30.0
	El Burro, 1931	2,200					31.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1980 average b/d	Cumulative to Dec. 31, 1980 bbl	
	Lacsmango, 1973.....	1,700					31.8
	Los Soldados, 1953.....	4,492					37.0
	La Venta, 1954.....	4,730					33.0
	Opario, 1957.....	5,790					33.0
	Otales, 1965.....	7,469					32.0
	Rodador, 1971.....	11,398					32.0
	S. Magallanes, 1957.....	4,240					30.0
	San Ramon, 1967.....	9,515					28.0
	Tonala, 1928.....	1,770	4,740	4,740		17,475,500,400	32.0
SOUTH ZONE, REFORMA	Agave, 1977.....	13,450					43.1
	Arroyo Zanapa, 1978.....	14,599					36.2
	Arteza, 1977.....	11,800					24.4
	Cacho López, 1977.....	14,250					29.0
	Cactus, 1972.....	14,100					36.0
	Carmel, 1960.....	10,050					45.6
	Camzo, 1962.....	3,500					23.3
	Comoapa, 1979.....	14,432					33.2
	Copano, 1977.....	11,890					47.3
	Chapala, 1979.....	12,136					47.3
	Giradas, 1977.....	15,225			205,369		48.0
	Inde, 1974.....	13,775					28.5
	Iris, 1979.....	14,432					38.8
	Muepac, 1962.....	9,676					58.5
	Mundo Nuevo, 1977.....	11,800					49.3
	Niepero, 1974.....	14,100					37.7
	Platanal, 1978.....	15,900					31.2
	Rio Nuevo, 1975.....	14,950					35.6
	Samana (Cret), 1973.....	14,208					31.0
	Sito Grande, 1972.....	13,786					35.0
	Sunupa, 1978.....	12,867					31.8
SOUTH ZONE, COMALCALCO	Tapulapa, 1962.....	15,613					39.8
	Topen, 1978.....	11,172					39.6
	Arteza (Terc), 1964.....	...					28.0
	Samana (Terc), 1965.....	4,920					13.9
	Ayapa, 1972.....	6,200					27.2
	Cestamal, 1967.....	10,080					30.9
	Cunduacan, 1974.....	13,775					27.6
	El Golpe, 1963.....	3,500					28.5
	Mora, 1961.....	...					36.1
	Oxtacaque.....	11,150			128,628		27.9
SOUTH ZONE, CARDENAS	Santuano, 1966.....	9,617					37.0
	Tintal, 1968.....	5,904					23.0
	Tupico, 1959.....	9,685					27.0
	Belote, 1962.....	17,056					36.8
	Caparroso, 1962.....	18,368					33.2
	Cardenas, 1979.....	17,548					38.0
	Eden, 1963.....	17,590					37.0
	Fentz, 1979.....	17,876			254,834		40.0
	Jolote, 1963.....	18,119					35.7
	Jujo, 1960.....	17,548					34.0
SOUTH ZONE, OCOSINGO	Paredón, 1978.....	15,690					36.8
	Tecominocan, 1963.....	19,519					33.2
	Fortuna Nacional.....	...					34.0
	Jose Colomo.....	...			174		34.0
MARINE ZONE, CD. DEL CARMEN	Vernet.....	...					34.0
	• Cantarel, 1978.....	8,528					21.3
MARINE ZONE, DOS Bocas	• Ku, 1979.....	10,000			1,219,969		22.0
	• Abkhatun, 1978.....	11,800					27.6
MARINE ZONE, DOS Bocas	• Poi, 1979.....	12,600					33.0
	• Chuc, 1962.....	13,100			573,728		35.0
	• Ixloc, 1974.....	...					29.9
Total Mexico.....			4,740	4,740	2,542,398	17,475,500,400	

MOROCCO

Essaours, 1976.....	10,500	6	6	339	810,757	40.0
Rharb, 1961.....	4,590	6	6	586	4,214,173	...
Mancha, 1957.....	3,000	...	...	...	...	...
Sidi Phalem, 1962.....	6,295-7,185	...	...	...	12,430,265	...
Other.....	...	...	...	...	...	...
Total Morocco.....		12	12	925	17,488,196	

MYANMAR^(e)

CHINA	Chauk-Lanywa, 1902.....	1,500-4,000				36.0
MYANMA	Mann, 1970.....	1,600-7,000				37.5
	Myingung, 1964.....	2,000-4,000	450	450	13,000	504,300,000
	Prome, 1965.....	850-8,000				36.0
	Yenangyaung, 1902.....	100-6,700				36.0
Total Myanmar.....			450	450	13,000	504,300,000

	Name of field, discovery date	Depth, ft	No. of wells		1980 average b/d	Cumulative to Dec. 31, 1980 bbl	API gravity
			Producing	Total			
NETHERLANDS	UNOCAL						
	• Haven, 1980	5,300	2	2	4,045	1,844,075	25.5
	• Helder, 1980	4,800	12	15	4,468	23,288,028	21.8
	• Helm, 1979	4,400	7	9	1,583	8,827,041	17.9
	• Hoon, 1981	5,000	7	8	3,482	22,214,290	25.8
	NAM						
	Berkel, 1954	—	17	17	3,611	8,038,000	32.1
	DeLier, 1955	5,200	22	33	605	17,341,000	33.2
	Ijsselmonde, 1956	—	59	86	3,838	93,819,000	28.8
	Meerkapelle, 1955	—	—	—	2,048	748,000	28.6
	Panis West, 1987	—	—	—	—	82,000	28.2
	Pinacker, 1955	—	4	5	307	6,460,000	36.3
	Rotterdam, 1984	—	2	2	4,128	5,221,000	30.5
	Schoonebaek, 1944	2,500	—	495	7,737	241,151,000	12.3
	Werkendam, 1956	—	—	—	16	258,000	33.0
	Zostermeer, 1957	3,200	30	30	764	10,611,000	16.5
	CONOCO						
	• Kotter, 1980	6,500	7	11	20,320	44,832,137	33.0
	• Logger, 1982	6,500	5	9	8,945	19,278,969	33.5
	AMOCO						
	• Rijn, 1982	6,800	13	28	4,320	18,774,817	36.0
	Total Netherlands		187	780	79,347	522,388,388	
NEUTRAL ZONE	AOC						
	• Hout, 1989	4,900-8,800	21	34	3,900	86,130,000	33.0
	• Khafj, 1981	4,400-7,300	135	165	229,580	2,849,320,000	28.2
	TEXACO & KOC ^(*)						
	• S. Fuwais, 1983	8,300	5	9	—	—	25.0
	• S. Umm Gudair, 1986	8,900	16	17	78,540	1,812,607,100	24.3
	Wafra, 1953	1,100-7,000	322	427	—	—	18.9-23.5
	Total Neutral Zone		488	652	312,880	4,728,957,188	
NEW ZEALAND	SHELL-BP-TODD						
	• Kapuni, 1959	11,700	11	14	—	—	54.0
	• Maui, 1969	11,000	14	14	—	—	51.0
	PCNZ						
	Ahuroa, 1987	8,888	—	1	—	—	48.1
	Kaimiro, 1982	11,900	2	2	38,000	110,726,300	42.0
	McKee, 1980	7,848-8,251	19	22	—	—	38.5
	Tariki, 1986	9,085	—	1	—	—	52.7
	Waihapa, 1988	10,125-10,643	5	6	—	—	38.6
	Total New Zealand		51	60	38,000	110,726,300	
NIGERIA	AGIP						
	• Abgere, 1981	7,500-12,000	16	16	25,774	13,547,028	36.2
	Agwa, 1975	10,800	1	2	408	2,307,927	44.0
	Akri, 1967	9,800-10,800	6	11	8,814	64,407,651	40.8
	Akri W., 1972	9,900-10,200	—	2	—	482,258	—
	Ashaka, 1968	9,700-12,000	1	1	1,011	3,344,898	37.4
	Azuzuama, 1975	8,700-14,800	2	2	1,288	483,258	34.1
	• Beniboye, 1978	9,000-10,000	9	9	6,433	18,688,435	28.8
	Bensku, 1974	12,000	1	2	129	3,407,816	14.8
	Clough Creek, 1976	10,000-12,400	9	9	9,318	28,799,784	25.5
	Ebaboro, 1975	11,500-12,000	6	9	6,197	86,771,341	37.1
	Ebocha, 1965	8,000-10,900	10	18	8,838	116,882,582	36.3
	Idu, 1973	7,750-10,700	—	10	—	23,882,581	—
	Kwale, 1967	10,000-11,500	6	8	8,370	13,274,523	37.1
	Mbede, 1966	7,300-9,400	10	16	12,589	172,997,980	43.1
	Obama, 1973	11,800-14,300	6	8	14,877	108,478,448	30.7
	Otielu, 1967	9,300-12,200	16	20	19,249	98,986,343	41.6
	Otrikom, 1967	8,000-10,000	8	14	6,981	59,785,580	43.4
	Odugri, 1972	12,500	1	2	1,710	10,946,737	45.9
	Ogbogosa, 1972	10,000	—	2	—	3,302,783	—
	Ogbogosa W., 1982	13,000	—	1	—	353,136	—
	Okpai, 1968	10,000-12,000	6	8	4,587	22,272,119	42.8
	Omoku W., 1974	11,500	1	1	945	5,227,184	40.0
	Oshi, 1972	9,800-11,300	10	11	13,137	75,660,065	36.2
	Taylor Creek, 1985	9,300-10,400	1	1	3,197	1,692,978	37.3
	Tekideba, 1972	10,300-11,300	7	10	15,901	130,095,927	30.4
	Umuoru, 1977	14,100	2	4	2,356	7,053,937	40.3
	ELF						
	Aghigo, 1972	7,303	18	21	6,674	25,900,000	24.8
	Erema, 1972	11,211	3	5	6,240	13,200,000	24.8
	Obagi, 1964	8,377	55	74	55,384	386,600,000	24.6
	Obodo-Jatums, 1966	—	18	17	16,471	75,000,000	24.8
	Okpoko, 1967	6,745	16	17	6,750	34,800,000	24.8
	Upomami, 1965	5,256	11	14	4,604	18,400,000	24.8
	GULF NIGERIA						
	Abiteye, 1970	5,750-9,400	12	19	6,788	88,620,694	39.7
	• Delta, 1965	5,600-9,500	22	27	18,348	183,549,519	37.3
	• Delta South, 1965	7,100-10,179	20	33	33,748	294,165,850	38.4
	• Isan, 1970	5,300-9,000	8	11	1,946	44,227,300	40.4
	Jiske, 1975	8,306-7,600	3	5	1,041	7,268,105	41.1
	Makarabe, 1973	7,100-12,005	23	26	24,294	109,307,897	27.7
	• Maiu, 1969	4,800-6,300	13	18	15,595	114,239,427	40.4
	• Meria, 1965	8,570-12,030	4	5	6,891	26,281,992	38.1
	• Meji, 1965	5,200-10,900	20	22	18,317	164,923,785	31.9

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1990 average bbl	Cumulative to Dec. 31, 1990 bbl	
• Meren, 1965	5,000-7,500	37	58	58,427	536,008,957	31.9
• Mina, 1965	...	3	3	4,730	3,975,460	40.3
• Okari, 1964	5,500-9,245	55	70	42,108	471,082,427	38.1
• Parabe/Eko, 1966	4,500-8,200	17	28	10,115	110,708,677	40.4
• Robertini, 1964	11,484-13,190	11	13	20,878	27,301,921	40.2
• Tapa, 1978	8,150-10,842	8	10	9,840	34,846,887	39.5
• Utonana, 1971	7,400-9,185	3	5	629	8,589,272	20.4
• W. Ilean, 1971	7,825-10,229	5	9	2,389	96,136,036	40.4
• Yorla South, 1974	11,389-12,635	...	2	...	822,618	41.0
TEXACO-CHEVRON-NMPC						
• Funwa, 1978	5,000-7,000	20	25	19,386	57,447,072	35.5
• Middleton, 1972	5,000-7,000	3	7	2,137	17,407,040	36.3
• North Apoi, 1973	4,000-8,100	25	28	34,706	189,057,507	35.5
• Pennington, 1965	5,000-10,100	2	9	2,348	28,733,949	38.5
• Sengana, 1987	11,400-12,800	...	2	...	866,102	46.7
MOBIL						
• Adua, 1967	5,970	7	11	10,664	55,007,899	34.8
• Asabo, 1966	5,600	9	27	16,492	173,832,194	34.6
• Asabo "D", 1979	7,621	1	2	1,199	3,186,472	34.6
• Ata, 1964	8,823	...	5	...	433	...
• Edop, 1968	9,215	1	9	38,905	33,368,719	37.4
• Ekpe, 1966	8,200	10	22	14,222	198,798,729	34.9
• Ekpe-WW, 1977	6,810	2	6	6,036	40,310,161	31.9
• Eku, 1966	5,420	3	14	2,487	18,375,442	30.4
• Eniang, 1968	8,800	18	38	17,281	144,339,212	37.4
• Etim, 1968	8,200	7	16	17,972	125,688,898	37.1
• Idoho, 1966	9,020	3	7	826	29,559,880	30.5
• Inim, 1966	5,850	7	14	13,432	154,868,705	37.5
• Isobo, 1968	7,345	3	7	14,841	14,358,750	30.4
• Iyak S.E., 1979	7,441	6	7	18,077	54,999,641	38.6
• Mfem, 1968	5,200	2	5	4,876	28,886,881	36.1
• Ubit, 1968	5,400	30	55	39,586	210,088,085	36.1
• Unam, 1967	5,180	7	15	10,782	52,159,220	33.3
• Usari, 1965	8,431	...	4	...	8,885	...
• Utue, 1966	5,700	5	14	10,901	77,819,051	38.6
PAN OCEAN						
• Ogharefe, 1973	9,900	7	18	1,158	29,669,008	48.6
DUBIL						
• Gili-Gili, 1967	9,357	3	7	906	1,137,667	47.1
SHELL						
• Adibawa, 1966	11,950	11	27	12,052	86,987,584	26.4
• Adibawa N.E., 1972	10,663	3	4	3,968	18,574,667	25.3
• Alam, 1966	8,000	8	22	2,287	81,356,325	45.6
• Alam Umu, 1957	10,024	...	4	...	2,378,685	...
• Alasara, 1966	8,500	29	35	11,844	125,204,182	19.6
• Alremo, 1972	9,263	10	15	15,908	18,077,037	36.8
• Agbada, 1960	10,000	29	53	19,894	196,223,121	23.9
• Aha, 1965	11,561	5	13	4,099	88,370,285	38.2
• Ayokpon, 1967	11,139	1	5	527	5,848,952	39.3
• Ayutu, 1970	13,324	1	5	971	10,304,503	34.7
• Akaso, 1979	13,122	2	3	1,432	4,293,082	37.1
• Akpor, 1965	10,149	...	3	...	1,833,108	...
• Akuba, 1967	10,434	1	1	254	4,486,154	22.7
• Alakin, 1959	10,189	12	26	7,430	70,945,576	44.5
• Amukpe, 1970	11,459	2	3	1,198	13,591,886	41.7
• Apara, 1960	9,000	3	10	3,799	29,300,026	38.4
• Asasa, 1961	9,738	2	4	1,060	5,949,721	20.6
• Bodo East, 1962	9,700	9	12	4,216	83,991,568	27.1
• Betan, 1968	11,000	9	10	7,777	60,320,288	21.7
• Benisade, 1973	8,941	15	22	34,325	127,045,999	21.9
• Bomu, 1958	7,000	6	49	6,146	359,457,322	37.3
• Bonny, 1959	12,254	7	23	4,303	93,146,273	32.6
• Buguma Creek, 1960	12,496	4	10	2,184	14,109,744	37.6
• Cawthorne Chan, 1963	11,000	21	40	47,581	314,445,240	36.9
• Diebu Creek, 1966	13,119	7	15	9,753	112,470,475	40.3
• Ebubu, 1958	9,411	3	10	206	18,883,643	21.2
• Egwa, 1967	9,350	18	29	16,944	146,784,895	34.1
• Egbema, 1960	8,731	6	8	3,120	56,520,126	33.1
• Egbema W., 1965	9,096	6	19	5,146	83,710,410	41.2
• Ekuama, 1958	10,483	21	33	44,882	231,433,712	31.6
• Elelenwa, 1960	11,000	6	18	3,716	35,119,812	35.8
• Enwhe, 1965	10,170	...	6	...	2,611,679	...
• Etelebou, 1971	12,000	8	11	14,529	132,206,501	31.3
• Eriemu, 1961	12,500	13	18	5,372	47,657,877	20.6
• Escravos Beach, 1969	8,176	9	14	12,344	86,420,461	31.2
• Ewreni, 1967	10,900	7	11	4,018	39,342,474	25.6
• Forcados Yorki, 1968	10,859	56	124	53,562	590,642,964	24.4
• Ibigwe, 1965	...	3	...	437,017	...	...
• Imo River, 1959	7,900	37	57	47,017	498,674,807	30.3
• Isimiri, 1964	8,450	1	8	381	38,370,370	29.3
• Isoko, 1960	12,479	4	6	2,368	7,099,065	29.8
• Jones Creek, 1967	8,000	29	38	37,541	423,977,565	29.7
• Kalaakuta, 1972	9,236	5	12	13,325	13,796,014	40.5
• Kolo Creek, 1971	12,000	17	38	20,691	144,265,152	39.1
• Kokori, 1961	8,900	25	32	19,387	322,186,233	39.9
• Korokoro, 1959	10,222	6	9	3,391	85,541,415	35.8

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		*API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
Krakama, 1958	9,890	3	13	1,982	18,773,262	22.9
Nembe Creek, 1973	12,213	39	49	96,778	285,191,169	31.0
Nikali, 1963	12,000	4	12	3,610	31,860,205	36.2
Nun-River, 1960	14,200	4	12	2,244	33,569,371	32.7
Oben, 1972	12,036	17	28	16,533	134,469,258	37.6
Obeakpu, 1975	8,274	2	5	2,983	19,318,618	26.3
Obele, 1964	10,040	...	5	...	4,721,597	...
Obigbo	...	...	...	...	396,727	...
Obigbo North, 1963	8,250	28	47	12,142	183,246,416	23.16
Odeama Creek, 1981	12,897	5	6	21,632	35,066,963	35.5
Odidi, 1967	10,980	34	44	46,405	239,265,369	36.2
Ogini, 1964	5,860	8	25	3,977	24,841,774	18.2
Oguta, 1965	10,300	13	28	10,622	136,391,060	43.2
Olororo, 1963	8,500	20	33	16,609	292,362,402	21.5
Onne, 1965	10,384	3	3	928	10,146,086	35.3
Opuama, 1972	9,214	2	7	2,498	27,407,327	43.7
Opobo South, 1974	9,849	3	10	4,092	21,782,134	43.7
Opukushi, 1962	7,823	12	18	25,222	133,578,606	28.3
Opukushi North, 1977	11,100	1	4	89	2,823,783	35.6
Oloibiri, 1956	10,367	...	18	...	20,061,673	...
Oroni, 1964	12,000	6	8	2,495	27,623,535	22.6
Orubiri, 1971	9,700	1	11	3,586	19,429,768	38.2
Osioka, 1967	11,721	2	4	869	7,820,325	26.2
Otami, 1973	9,440	3	6	1,246	15,021,319	21.0
Otumara, 1969	8,176	26	32	46,204	168,341,053	24.9
Owah, 1964	12,300	9	11	5,944	98,666,011	25.8
Oza	...	...	...	...	1,006,373	...
Rapele, 1965	11,627	1	6	484	23,188,706	44.0
Rumuekpe, 1961	11,016	2	4	1,978	2,551,316	29.3
Saghara, 1970	8,590	5	8	7,152	37,421,364	31.8
Sapele, 1969	12,788	6	23	10,725	122,119,031	42.9
Soku, 1958	11,500	16	25	9,563	118,849,660	27.7
Tai, 1965	10,367	2	3	799	5,179,269	38.3
Ubie, 1961	14,380	5	10	5,078	34,889,280	27.6
Ughada, 1966	8,618	1	2	90	1,094,622	37.7
Ughelli East, 1959	11,800	8	14	2,803	91,534,764	38.9
Ughelli West, 1960	8,800	9	14	7,280	37,854,301	20.5
Umuchem, 1959	8,250	8	23	4,510	151,464,846	37.2
Utapatte South, 1974	10,497	8	12	9,005	42,591,450	38.5
Utorogu, 1964	9,000	17	30	8,454	136,284,367	26.8
Uzere East, 1960	8,500	10	15	6,119	92,598,622	28.6
Uzere West, 1963	8,500	11	11	5,803	103,685,793	25.4
Wari River, 1961	12,264	2	5	1,234	15,816,865	29.8
Yorla, 1970	11,917	10	16	6,629	64,229,584	39.2
Yorla South, 1979	12,190	...	2	...	822,674	...
ASHLAND						
• Adanga, 1980	14,088	7	19	11,376	24,560,874	32.1
• Akam, 1980	6,700	5	13	5,735	21,644,440	35.6
• Bogi, 1989	8,256	2	4	2,002	1,294,064	23.2
• Ebughu, 1984	7,250	3	4	906	911,781	28.0
• Izombe, 1974	9,500	8	32	10,190	57,585,735	37.8
• Mimbo, 1984	7,973	2	5	5,586	2,583,080	30.7
• Ossu, 1974	8,905	7	9	843	5,570,639	40.7
• Ukpam, 1989	7,425	1	2	1,695	1,564,018	40.6
TENNECO						
Abura, 1979	13,471	2	5	1,875	17,932,465	44.7
Total Nigeria		1,574	2,754	1,810,913	13,708,230,839	

NORWAY

AMOCO	• Hod, 1974	8,860	5	5	27,469	10,817,021	34.0
	• Valhall, 1975	8,200	23	26	64,972	178,725,234	35.0
BP	• Gyda, 1961	13,123	7	11	25,788	9,415,770	48.0
	• Ula, 1976	11,800	8	14	94,915	132,490,825	44.6
CONOCO	• Murchison*, 1975	9,900	21	34	8,114	63,656,330	38.0
NORSK HYDRO	• Oseberg, 1979	7,500	11	15	300,000	198,000,000	34.0
PHILLIPS	• Albuskjell, 1972	10,400	7	19	3,499	43,439,601	45.0
	• Cod, 1968	9,500	6	8	800	15,951,706	55.0
	• Edda, 1972	10,480-10,600	7	7	4,099	24,218,952	41.5
	• Ekofisk, 1968	10,000	40	50	154,387	967,763,127	41.1
	• Eldfisk, 1970	9,350-10,000	37	39	59,600	283,921,186	41.1
	• Tor, 1970	10,300	12	13	7,200	113,065,189	36.0
	• West Ekofisk, 1970	10,300	7	13	1,900	72,244,461	43.9
	• Gullfaks, 1978	9,500-9,700	39	54	255,556	270,595,800	29.3
STATOIL	• Statfjord, 1974	9,500	66	100	574,073	1,979,818,152	36.2
	• Tommeliten, 1976	10,400	6	6	11,906	10,573,277	47.0
	• Vesistrikk, 1981	10,100	6	11	49,518	18,038,588	...
Total Norway			308	425	1,843,806	4,412,735,219	

*Norway share (22.2%) of total production.

OMAN

PDO	Al Burj, 1987	6,890	6	7	8,219	3,000,000	28.0
	Al Ghubar, 1978	1,916	3	6	8,219	10,000,000	29.0
	Al Huwaisah, 1989	5,320	43	47	16,438	183,000,000	39.0

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity	
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl		
Alam, 1967	...	...	...	2,740	1,000,000	33.0	
Amal, 1977	...	...	...	8,219	14,000,000	19.0	
Amal S, 1982	...	34	39	2,740	6,000,000	30.0	
Anzauz, 1974	7,098	4	4	5,479	10,000,000	46.5	
Bahja, 1984	5,697	10	12	13,699	18,000,000	47.2	
Barik, 1978	8,856	3	3	2,740	4,000,000	47.4	
Fahud, 1963	2,499	153	235	57,534	815,000,000	32.0	
Fahud West, 1965	...	...	...	2,740	1,000,000	34.0	
Ghaba North, 1972	2,227	14	25	2,740	58,000,000	33.5	
Habur, 1975	5,800	1	2	13,699	5,000,000	15.0	
Hasirah, 1984	8,708	10	12	8,219	10,000,000	48.8	
Ihsan, 1984	5,578	5	6	2,740	2,000,000	23.5	
Jalmud, 1979	4,236	3	3	2,740	1,000,000	24.0	
Jawdah, 1984	3,570	6	7	2,740	3,000,000	28.5	
Karim W., 1982	3,546	26	27	13,699	24,000,000	23.0	
Kaukab, 1983	8,282	1	1	2,740	2,000,000	31.0	
Lekhwair, 1974	4,352	47	63	24,656	84,000,000	37.5	
Marmul, 1977	5,087	169	185	32,877	149,000,000	21.5	
Natih, 1963	4,788	36	68	24,656	369,000,000	33.4	
Nimr, 1980	3,296	117	119	41,096	53,000,000	21.0	
Qaharir, 1978	4,536	27	32	8,219	29,000,000	30.4	
Qarat Al Mith, 1973	4,936	...	...	2,740	1,000,000	29.0	
Qata, 1979	4,707	11	16	2,740	6,000,000	28.0	
Qaharir East, 1978	...	2	4	2,740	1,000,000	25.5	
Rahab, 1978	3,237	21	28	2,740	9,000,000	25.0	
Rajaa, 1988	...	...	...	2,740	1,000,000	50.0	
Ramlat Rawl, 1987	2,720	1	1	5,479	2,000,000	37.0	
Rima, 1979	3,247	47	48	71,233	179,000,000	33.0	
Runib, 1978	3,215	10	10	2,740	4,000,000	21.1	
Saih Nihayda, 1972	8,700	21	28	24,656	178,000,000	39.6	
Saih Rawl, 1973	9,826	14	24	8,219	97,000,000	39.0	
Sayyala, 1982	3,690	14	14	32,877	50,000,000	50.1	
Shibkah, 1968	2,591	...	2	2,740	1,000,000	29.0	
Simaim, 1985	5,250	11	12	5,479	7,000,000	30.6	
Suwaihat, 1982	6,452	10	10	5,479	18,000,000	37.5	
Thamoud, 1987	3,773	...	...	2,740	1,000,000	23.0	
Thuleilat, 1980	...	14	15	2,740	4,000,000	25.5	
Waira, 1983	5,510	7	8	5,479	6,000,000	38.8	
Warad, 1985	4,922	5	5	2,740	2,000,000	22.0	
Yibal, 1963	8,465	194	206	164,384	782,000,000	36.5	
Zahra, 1986	6,562	5	5	2,740	2,000,000	32.0	
Zareef, 1985	3,264	10	11	13,699	15,000,000	47.0	
Zauliyah, 1981	8,177	10	14	5,479	17,000,000	44.3	
Zymurud, 1988	...	...	...	2,740	1,000,000	29.0	
OCCIDENTAL	Safah, 1983	6,500	100	111	24,142	24,607,013	42.0
ELF GROUP	Ramlat	...	1	1	53	187,360	46.0
	Sahmah, 1978	12,400	11	11	5,127	28,351,500	46.0
Total Oman		1,237	1,487	714,253	9,289,125,873		

PAKISTAN

PAKISTAN	PAKISTAN ^(a)	Bekassar, 1946.....	9,398	4	17			26.0	
	OILFIELD LTD.	Dhulan, 1936.....	8,899	12	49			48.0	
		Meyal, 1968.....	12,513	6	6			41.3	
		Joya Mair, 1944.....	6,900	2	4			15.0	
		Khaur, 1915.....	9,306	13	397			33.0	
PAKISTAN PETROLEUM LTD. ^(a)	OGDC ^(a)	Adhi, 1978.....	9,452-9,613	5	5			51.0	
		Bobli, 1966.....	9,515-7,897	3	3			52.0	
		Chak-Naurang, 1986.....	9,187	3	4			12.1	
		Finkassar, 1982.....	11,465	1	1			29.4	
		Ghotana, 1986.....	7,300	1	1			41.1	
		Lashari Centre, 1986.....	6,916	1	1			44.2	
		Pasehki, 1989.....	7,153	1	1	44,978	186,743,036	43.0	
		Sono, 1986.....	7,618	3	4			40.5	
		Tando Alam, 1984.....	6,890-7,448	4	10			41.7	
		Thora, 1987.....	7,548	5	5			42.2	
		Toot, 1968.....	15,135	5	14			39.0	
		UNION TEXAS ^(a)	Dabhi, 1984.....	5,594	2	4			42.0
			Khasaki, 1981.....	3,387	4	11			38.0
			Laghari, 1983.....	2,584	4	7			42.0
			Mazari, 1985.....	3,888	5	5			43.0
South Mazari, 1985.....	3,920		2	4			43.0		
Other.....	...		7	8			31.0-46.0		
OCCIDENTAL	Bhangali, 1989.....	12,650	1	1	1,783	856,773	32.5		
	Dhumal, 1984.....	13,100	3	6	15,239	34,136,376	38.0		
Total Pakistan.....			97	588	62,000	221,736,186			

PERU

PERU	PETROMAR S.A.	• Litoral, 1955.....	1,500-6,000	91	134	1,925	38,856,380	36.0-40.0
		• Lobitos, 1960.....	3,500-7,500	137	278	9,554	58,278,803	36.0
		• Pena Negra, 1960.....	3,000-8,500	147	306	7,909	115,445,798	36.0

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1990 average bbl	Cumulative to Dec. 31, 1990 bbl	
OCCIDENTAL						
• Providencia, 1967	3,000-7,000	45	93	1,831	22,550,865	38.0-40.0
Other	...	2	24	54	31,541	...
Barra, 1979	8,000-8,900	14	16	5,306	21,152,135	11.6
Capahuan Sur, 1973	11,800-12,900	15	27	7,116	137,405,946	33.7
Dorissa, 1978	9,800-10,600	5	13	7,366	42,117,699	32.0
Forestal, 1973	9,000-9,900	8	12	5,177	38,586,174	18.5
Huayun Sur, 1977	10,000-10,800	9	12	3,451	20,765,040	28.5
Jibaro, 1981	9,000-9,650	2	5	5,053	15,031,355	10.5
Jibaro, 1974	10,110-10,155	5	6	3,071	9,451,608	10.8
San Jacinto, 1978	7,200-9,760	9	22	5,831	33,219,653	14.9
Shiviyacu, 1973	9,100-10,100	19	27	17,908	78,133,229	20.3
Other	...	2	13	2,157	3,064,912	21.3
OCCIDENTAL/BRIDAS						
Talara area, 1978	1,343-6,080	761	1,101	5,983	50,797,833	34.8
PETROPERU						
Agua Caliente, 1939	1,000-15,000	7	12	119	14,416,361	42.0
Capirona, 1972	9,800-12,000	1	5	407	3,891,327	25.0
Corrientes, 1971	10,000-12,600	28	36	16,709	107,634,867	24.9
Maquia, 1957	2,100-2,400	19	29	1,850	13,610,702	37.5
N. Esperanza, 1980	10,200-10,700	...	3	498	5,752,323	42.5
Pacaya, 1963	...	...	3	...	52,367	...
Pavayacu, 1972	9,600-11,300	9	14	2,527	18,381,009	29.5
Selva Central	...	...	...	...	...	36.0
Talara-Lima area, 1969	2,000-9,000	1,958	6,154	18,856	986,886,673	32.3
Valencia, 1975	10,500-11,200	...	2	...	546,548	43.0
Yanayacu, 1974	11,400-13,600	6	9	752	4,779,917	18.8
Total Peru		3,290	8,356	131,430	1,823,132,975	
PHILIPPINES						
ALCORN PHILIPPINES						
• Galoc, 1981	7,260-7,280	...	1	...	383,460	37.2
• Matnloc, 1978	6,656-6,750	3	5	815	10,162,235	43.8
• Nido, 1977	6,576-6,885	3	5	565	16,262,931	27.1
• North Matnloc, 1987	6,830-7,021	3	3	2,107	1,692,091	43.2
ALCORN PALAWAN						
• Cadiao, 1977	5,734-5,881	2	2	1,235	10,807,560	45.6
TRANS-ASIA OIL & MINERAL						
• South Tara, 1987	4,335-4,436	...	1	45	221,408	40.4
Total Philippines		11	17	4,767	36,619,694	
QATAR						
QGPC						
• Bul Hanine, 1970	6,000	20	35	127,793	821,534,316	35.0
Dukhan, 1940	6,500	182	237	217,435	2,647,267,520	41.1
• Idd El Shargi, 1960	4,500-8,250	17	42	9,999	207,075,106	35.0
• Maydan-Mahzam, 1963	7,000	19	41	50,410	790,017,582	38.0
Total Qatar		238	355	405,637	4,465,894,526	
RAS al KHAIMAH^(e)						
RAKOPET						
• Saleh, 1963	14,500	7	7	750	12,775,000	50.0
Total Ras al Khaimah		7	7	750	12,775,000	50.0
SAUDI ARABIA^(e)						
ARAMCO						
Abqaiq, 1940	6,690	...	...	...	...	37.0
Abu-Hadrya, 1940	9,340	...	...	...	...	35.0
Abu Jifan	...	...	...	...	...	...
• Abu-Safah, 1963	6,600	...	...	...	...	30.0
Baki	...	...	...	...	...	...
• Bern, 1964	8,300	...	...	...	...	32.0-34.0
Dammam, 1936	4,800	...	...	...	...	35.0
Dhib	...	...	...	...	...	...
Dibdibah	...	...	...	...	...	...
Duhul	...	...	...	...	...	...
El Haba	...	...	...	...	...	...
Fadhli, 1949	8,050	...	...	...	...	39.0
Farfah	...	...	...	...	...	...
Fandah	...	...	...	...	...	...
Ghawar, 1948	6,920	...	...	...	...	34.0
Habari	...	...	...	...	...	...
• Hamur	...	...	...	...	...	...
Harmaliyah, 1971	8,430	...	...	...	...	35.0
• Harqus	...	...	...	...	...	...
• Hasbah	...	...	...	...	...	...
Jaham	...	...	...	...	...	...
Jafadi	...	...	...	...	...	...
• Janda	...	...	...	...	...	...
Jauf	...	1,235	1,235	6,257,600	59,618,621,094	...
Jawb	...	...	...	...	...	...
Juraybiat	...	...	...	...	...	...
• Jurayd	...	...	...	...	...	...
• Karan	...	...	...	...	...	...
Khurais, 1957	5,200	...	...	...	...	33.0
Khursaniyah, 1956	6,560	...	...	...	...	31.0
• Kurayn	...	...	...	...	...	...
• Lawfah	...	...	...	...	...	...

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		1990 average b/d	Cumulative to Dec. 31, 1990 bbl	*API gravity
			Producing	Total			
	Lughish.....	...	...	...	...	...	...
	• Maharah.....	...	...	...	...	...	...
	• Manifa, 1957.....	7,950	...	...	...	...	...
	• Marjan, 1967.....	6,800	...	...	...	...	33.0
	Mazali.....	...	...	...	...	...	...
	Qatuf, 1945.....	7,100	...	...	...	...	33.0-34.0
	Qirdi.....	...	...	...	...	...	...
	• Ribyan.....	...	...	...	...	...	...
	Rimthan.....	...	...	...	...	...	...
	• Safaniya, 1951.....	5,100	...	...	...	...	27.0
	Sahba.....	...	...	...	...	...	...
	Samin.....	...	...	...	...	...	...
	Shanir.....	...	...	...	...	...	...
	Suban.....	...	...	...	...	...	...
	Tinat.....	...	...	...	...	...	...
	Wan'ah.....	...	...	...	...	...	...
	Wetban.....	...	...	...	...	...	...
	• Zukuf, 1965.....	5,800	...	...	...	...	32.0
	Total Saudi Arabia.....		1,235	1,235	6,257,800	59,618,621,064	
SHARJAH	AMOCO Saaja and Moveyd ^(C) , 1980.....	10,200-12,300	16	16	22,580	123,667,200	50.0
	CRESCENT ^(e) • Mubarak ^(C) , 1972.....	12,650	4	4	5,000	101,275,000	50.0
	Total Sharjah.....		20	20	27,580	224,942,200	
SPAIN	SHELL ESPANA • Amposta Marino Norte, 1970.....	10,000	...	8	...	55,667,000	37.0
	• Tarraco (Castellon BS-8), 1973.....	9,000	...	3	...	14,547,000	35.0
	CHEVRON Ayoluengo, 1964.....	4,600-5,200	35	43	582	15,582,664	37.0
	REPSOL • Angula, 1984.....	12,600	...	1	...	...	44.0
	• Casablanca, 1975.....	8,900	7	9	13,487	100,344,916	33.0
	• Dorada, 1975.....	6,700	...	4	...	17,843,906	21.5
	• Gavota ^(C) , 1980.....	8,300	2	3	2,111	3,043,131	52.7
	• Salmonete, 1984.....	12,600	...	1	...	...	44.0
	Total Spain.....		44	72	16,180	207,038,617	
SURINAME	STAATSOLIE Tambaradjo, 1981.....	1,050	153	153	3,935	6,297,277	15.9
	Total Suriname.....		153	153	3,935	6,297,277	
SYRIA	AL FURAT OIL CO. (SHELL) Al Ishara East, 1966.....	...	...	...	7,397	8,100,000	36.1
	Al Kharrata East, 1966.....	...	...	...	822	900,000	37.5
	El Ahmar, 1966.....	...	...	...	4,384	6,100,000	34.8
	El Isba, 1966.....	...	...	...	15,068	8,200,000	37.0
	El Ward North, 1966.....	...	...	...	26,027	24,000,000	36.1
	Jamof, 1960.....	...	...	...	1,918	700,000	39.0
	Jido, 1966.....	...	...	...	1,370	3,100,000	35.0
	Maich, 1990.....	...	...	...	274	100,000	34.0
	Omar, 1987.....	...	...	...	18,356	21,100,000	41.5
	Omar North, 1989.....	...	...	...	7,945	3,300,000	45.0
	Rathia, 1963.....	...	...	...	5,479	2,000,000	34.5
	Saban, 1989.....	...	...	...	6,027	2,200,000	40.0
	Sarhit, 1986.....	...	...	...	2,740	1,100,000	41.0
	Shahel, 1966.....	...	...	...	6,849	3,000,000	40.5
	Shohba, 1969.....	...	...	...	4,110	1,500,000	35.0
	Sijan, 1989.....	...	...	...	28,219	10,400,000	35.0
	Tanak, 1987.....	...	...	...	20,822	11,100,000	36.5
	Tayyari East, 1988.....	...	...	...	8,493	5,800,000	36.0
	Thayyem, 1983.....	...	...	...	79,726	112,700,000	36.5
	S.P.C. ^(e) Allan, 1974.....	5,900	25	37	...	...	19.0
	Obebeh, 1976.....	2,300	54	75	...	...	18.0*
	Jebessah, 1968.....	2,000-3,300	132	219	...	...	18.0
	Karachok, 1956.....	6,500	103	119	141,973	1,193,315,220	20.0
	Rumlan, 1962.....	6,500	59	66	...	...	24.0
	Soudia, 1959.....	6,500	532	579	...	...	24.0
	Tichine, 1976.....	2,600	58	73	...	...	18.0
	Total Syria.....		963	1,168	388,000	1,418,515,220	
THAILAND	UOICAL • Baanpot ^(C) , 1980.....	7,000	19	30	1,172	3,124,380	54.0
	• Erawan ^(C) , 1973.....	7,000	95	105	7,919	22,291,090	54.6
	• Kaphong ^(C) , 1974.....	8,000	18	24	2,640	1,293,660	55.0
	• Platong ^(C) , 1976.....	8,500	20	49	1,526	7,148,380	59.1
	• Satun ^(C) , 1980.....	8,500	62	68	5,951	10,156,570	55.1
	• South Satun ^(C) , 1980.....	...	16	22	196	72,160	54.0
	THAI SHELL Sirkit, 1981.....	5,258-5,976	67	103	...	...	19.0
	Pru Krathiem, 1984.....	4,200	1	2	22,759	...	19.0
	Pratu Tao, 1981.....	...	1	1	...	50,477,850	41.0
	Sirkit West, 1983.....	5,500	...	...	...	...	41.0

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1980 average b/d	Cumulative to Dec. 31, 1980 bbl	
	Thap Raet, 1989	11,100	...	...			41.0
	Wat Taen, 1988	7,790	...	...			37.0-40.0
	Total Thailand		298	484	42,165	94,564,120	
TRINIDAD AND TOBAGO							
AMOCO	• Cassia, 1973	12,700	9	9	3,601	15,499,000	...
TRINIDAD OIL CO. LTD.	• Mora, 1982	8,500	2	2	254	821,000	...
	• Pou, 1974	11,650	38	40	18,809	171,384,000	...
	• Samaan, 1971	11,780	37	47	13,050	189,511,000	...
	• Teak, 1959	15,191	60	71	39,614	265,671,000	...
TRINIDAD & TOBAGO OIL CO. LTD. (TRINTOC) ⁽⁶⁾	Area IV and Guapo, 1963		85	192			...
	Barrackpore, 1911	11,100	83	379			...
	Brighton, 1903	7,500	59	620			...
	Catchill, 1950	9,693	31	134			...
	Forest Reserve, 1913	11,000	289	2,042			...
	Grand Ravine, 1929	11,000	51	168			...
	Guayaguayare, 1902	10,750	115	699			...
	Oropouche, 1944	9,100	29	128			...
	Palo Seco, 1929	12,700	77	939			...
	Panaylands 1-5, 1913	10,626	118	508			...
	Penal, 1936	11,067	78	289			...
	Point Fortin C & W, 1907	10,626	124	551	75,663	1,911,965,000	...
	Trinity, 1956	9,700	20	95			...
	Other		63	813			...
TRINIDAD NORTHERN ⁽⁶⁾ AREAS (TNA)	• Fortin Offshore (FOS), 1954		12	35			...
	• Soldado, 1955	11,000	371	673			...
TRINIDAD & TOBAGO PETROLEUM CO. LTD. (TRINTOPEC) ⁽⁶⁾	Centari Los Bajos, 1973		162	221			...
	Coora/Quarry, 1936	14,000	151	736			...
	Fyzabad/Apex/Quarry, 1920-38	11,000	300	1,042			...
	Galeota, 1963	6,304	47	105			...
	Palo Seco/Enn/McKenzie, 1926	12,718	493	1,581			...
	Other		196	923			...
PREMIER CONSOLIDATED OILFIELDS LTD. (P.C.O.L.) ⁽⁶⁾	All fields		103	503			...
	Total Trinidad and Tobago		3,203	13,545	150,791	2,554,851,000	
TUNISIA							
ELF-ETAP	• Ashtart	10,500	15	20	25,682	202,419,879	29.8
ELF-SEREPT	Douleb/Semmama, 1966	3,937	12	15	539	18,351,768	40.0
	Tamesmda, 1967	3,937	3	3	160	2,209,426	36.9
ETAP-AGIP-FINA (SODEPS)	Debech, 1980	7,500	1	1	17	265,730	42.8
	Lanch, 1979	7,550	1	2	107	353,070	41.0
	Makrouga, 1980	6,230	4	4	5,690	9,644,920	45.6
AGIP-TUNISIA (SITEP)	Cousch es Saïda, 1971	12,600	1	1	250	2,892,240	43.2
	El Borma, 1964	8,250-8,900	95	130	50,950	559,242,860	...
BRITISH GAS	El Ain, 1980	8,500	1	1	1,684	1,243,000	41.0
MARATHON	Ezzaouia, 1986	6,800	5	5	2,000	715,000	40.0
SHELL ⁽⁶⁾	• Tazerka, 1979		...	...	2,886		30.0
CFPT ⁽⁶⁾	Sidi El Hayem, 1971	7,500-7,800	21	23	2,507	164,925,365	44.0
	Total Tunisia		159	205	92,472	962,263,258	
TURKEY							
ALADDIN MIDDLE EAST LTD.	Kahta, 1958	3,500	11	25	142	4,182,072	11.0
	Yasince, 1974	6,400	2	4	10	13,752	31.0
	Zeynel, 1990	4,700	1	1	11	3,909	23.0
MOBIL	Bulgurdağ, 1961	4,500	2	2	37	2,509,803	37.2
	Selmo, 1964	5,800	22	22	3,995	69,540,485	34.2
SHELL	Barbes, 1972		18	22	1,260	17,260,000	37.2
	Baysu, 1985		6	7	904	1,490,000	34.5
	Bektas, 1985		1	1	274	540,000	34.7
	Beykan, 1964		38	46	2,356	61,520,000	33.2
	Kastel, 1950		...	...	356	130,000	34.7
	Katin, 1971		3	8	82	3,760,000	29.7
	Kay West (deep), 1970		...	...	1,507	550,000	34.1
	Kayakoy West (OF), 1964		19	29	767	31,720,000	34.1
	Kayakoy, 1960		14	27	1,288	20,670,000	38.2
	Koprü, 1980		...	...	27	10,000	35.2
	Kurkan, 1963		29	35	1,315	50,100,000	31.4
	Kurkan S, 1965		5	10	1,233	7,690,000	34.5
	Malatepe, 1970		14	15	575	7,400,000	32.7
	Northern Trend, 1972		...	...	82	350,000	30.0
	Phyanko, 1968		1	3	82	1,550,000	35.3
	Sahaban, 1965		7	13	712	13,700,000	34.5
	Sahaban SE, 1983		2	2	110	510,000	34.5
	Sincan, 1979		8	9	877	3,640,000	31.4
	Yatir E, 1973		9	11	274	5,550,000	30.9
	Yenikoy E, 1974		2	2	356	4,700,000	31.3
	Yesildere, 1985		3	3	775	880,000	34.5

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		°API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
TPAO						
Adiyaman, 1971	5,800	10	10	685	8,671,031	27.8
Alpinar, 1984	10,500	—	—	—	157,937	31.6
Alici, 1983	6,500	1	1	4	96,864	32.0
B. Firat, 1986	8,150	11	11	134	1,803,829	34.8
B. Kozluca, 1985	5,000	23	23	727	1,828,855	12.0
B. Selmo, 1981	5,500	3	3	179	804,469	34.0
Bati Raman, 1961	4,200	149	149	9,026	41,187,581	13.3
Besikli, 1989	6,234	3	3	1,118	408,041	25.6
Beycayir, 1976	7,700	1	1	31	219,201	26.4
Bolukyayla, 1977	10,300	—	—	—	167,663	35.0
Camurlu, 1976	5,600	14	14	301	1,296,898	12.2
Celikli, 1964	10,500	11	11	616	4,046,269	35.2
Cemberlitas, 1983	6,500	17	17	1,865	8,815,619	30.5
Cendere (J.V.), 1989	8,856	3	3	1,453	530,204	29.4
Cukuritas, 1985	10,000	—	—	—	219,021	36.0
Devecatak, 1973	4,800	2	2	77	299,035	37.0
G. Adiyaman, 1977	5,000	—	—	—	115,836	20.4
G. Dincer, 1981	5,350	14	14	846	5,170,219	16.7
G. Karakus, 1989	7,900	3	3	1,049	422,656	28.5
G. Kayakoy, 1976	8,600	1	1	160	2,405,770	30.4
G. Sahabani, 1978	5,450	7	7	455	3,400,791	33.2
G. Sancak, 1973	5,250	10	10	517	4,573,485	31.5
Garzan, 1956	4,700	16	16	1,192	33,820,729	26.2
Germik, 1968	6,500	9	9	223	3,589,634	18.3
Izuztepe, 1976	4,900	—	—	—	86,051	11.3
K. Karakus, 1989	8,498	5	5	5,272	1,962,077	29.0
K. Osmancik, 1971	3,800	3	3	229	2,259,094	37.6
Karsali (J.V.), 1989	9,941	1	1	194	162,051	24.6
Karakus, 1988	8,850	15	15	17,736	9,672,352	30.0
Kartaltepe, 1982	6,550	3	3	293	1,124,863	32.0
Kastel (J.V.), 1989	7,625	2	2	727	265,386	34.7
Kurtalan, 1961	5,750	1	1	20	259,455	31.9
Kuzey Adiyaman, 1977	9,500	—	—	—	59,375	32.0
Magrip, 1961	5,700	9	9	619	15,336,442	18.4
Mehmetdere, 1982	6,700	—	—	—	157,439	31.0
Oyuktas, 1972	7,600	—	—	—	592,005	31.0
Raman, 1940	4,500	77	77	4,042	53,536,328	18.7
S. Sinan, 1987	3,900	4	4	80	148,048	13.0
Sancak, 1973	5,250	4	4	204	2,811,755	31.5
Sezgin, 1970	5,600	—	—	—	87,559	17.0
Silivanka, 1962	8,200	11	11	728	8,473,463	23.0
Sivritepe, 1977	8,200	—	—	—	591,789	33.4
Yanarsu, 1990	4,725	1	1	26	9,520	14.7
Yenikoy, 1973	6,400	23	23	2,006	10,500,534	31.4
Total Turkey		684	766	72,241	542,121,224	

UNITED KINGDOM

AMOCO	• Arbroath, 1969	8,100	7	10	22,576	8,240,157	37.0
	• Indefatigable ^(C) , 1966	8,500	33	39	463	4,575,302	46.0
	• Leman (ELU) ^(C) , 1966	6,500	84	91	302	3,476,642	51.0
	• Montrose, 1969	8,100	14	20	1,392	80,121,321	37.0
	• NW Hutton, 1975	11,200	30	39	17,694	105,342,717	36.0
BP	• Beatrice (A & B), 1976	6,750	27	39	24,808	—	38.4
	• Buchan, 1974	8,700	9	9	17,553	—	33.0
	• Clyde, 1978	12,400	10	30	38,257	—	38.1
	• Cyrus, 1979	8,265	2	4	5,526	—	35.5
	• Deveron, 1972	9,000	3	3	4,495	—	38.2
	• Don, 1976	11,200	3	4	6,238	—	42.0
	• East Midlands, 1939	3,500	65	132	24,204	—	36.0
	• Forties and Echo, 1970	7,000	79	103	193,024	—	37.0
	• Kimmeridge, 1959	1,705	1	1	37,004	3,126,892,477	40.0
	• Magnus, 1974	9,500	11	11	135,427	—	39.0
	• Nettleham, 1983	8,850	1	2	7,782	—	35.0
	• Scampton, 1965	5,360	1	3	7,305	—	—
	• Stainton, 1984	5,200	1	3	443	—	—
	• Thistle, 1973	9,000	33	52	29,731	—	38.0
	• Welling, 1981	5,000	—	—	40,262	—	36.0
	• Wytch Farm Bridport Sand, 1974	3,031	10	16	—	—	37.0
	• Wytch Farm Sherwood Sandstone, 1978	5,198	5	5	—	—	37.9
CHEVRON	• Ninian, 1974	10,000	74	105	116,903	900,856,024	35.6
CONOCO	• Hutton, 1973	10,000	15	27	28,632	127,881,199	33.0
	• Murchison ¹ , 1975	9,901	21	34	28,509	223,083,893	38.0
HAMILTON BROS. OIL & GAS LTD.	• Argyll, 1971	9,000-9,400	7	7	4,920	70,030,000	38.0
	• Crawford, 1975	6,900-8,500	5	5	4,940	3,930,000	30.0
	• Duncan, 1980	9,600-10,000	2	2	1,080	18,370,000	36.0
	• Innes, 1983	12,300-12,600	2	2	850	5,750,000	45.0
MARATHON	• Central Brae, 1976	14,100-15,000	3	5	15,500	7,000,000	33.0
	• North Brae ^(C) , 1975	11,900-12,475	11	16	80,400	66,000,000	45.0
	• South Brae, 1975	12,700-13,437	12	29	33,400	226,000,000	35.0

WORLDWIDE PRODUCTION

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
MOBIL						
• Beryl, 1972	9,900-11,500	41	67	94,700	461,983,427	37.0
• Linnhe, 1988	11,500-12,065	1	2	1,100	577,286	37.8
• Ness, 1986	9,900-10,112	4	6	10,400	16,977,501	37.0
OCCIDENTAL						
• Claymore, 1974	8,100	17	29	39,525	339,020,933	30.1
• Piper, 1973	8,100	...	...	...	834,416,000	37.0
• Scapa, 1981	8,100	5	5	24,859	30,359,688	32.0
SHELL						
• Auk, 1971	...	9	11	8,219	85,700,000	36.0
• Brent, 1971	...	53	130	73,973	1,304,400,000	40.0
• Cormorant, 1972	...	17	37	86,027	355,600,000	36.0
• Dunlin, 1973	...	26	40	22,669	325,528,000	36.0
• Eider, 1976	...	...	...	40,548	30,000,000	34.0
• Fulmar, 1975	...	13	28	149,247	446,620,000	40.0
• Kittiwake, 1981	...	...	...	5,205	1,900,000	30.0
• Tern, 1975	...	...	...	34,247	18,900,000	34.0
PHILLIPS						
• Maureen, 1973	8,000-8,700	6	12	32,005	166,560,640	35.9
TEXACO NORTH SEA						
• Highlander, 1976	8,759-9,372	5	7	18,000	47,423,000	34.0
• Petronella, 1975	8,110	1	1	12,300	15,232,000	40.2
• Tartan, 1974	10,217-12,614	8	20	16,200	78,108,000	38.0
TOTAL OIL MARINE						
• Alwyn North, 1975	10,170-11,155	10	30	89,400	90,210,500	39.0
UNOCAL						
• Heather, 1973	10,800	24	40	11,040	88,209,901	34.3
ELF UK						
• Crosby-Warren, 1986	...	...	...	129	306,000	...
STATOIL^(*)						
• Statfjord, 1975	9,500	59	93	108,616	315,020,800	39.0
Total United Kingdom		880	1,406	1,807,809	10,030,701,408	

*U.K. share (77.8%) of total production.

UNITED STATES*

Alabama, 1944	...	902	...	50,789	321,538,000	...
Alaska, 1905	...	1,392	...	1,773,452	9,122,310,000	...
Arizona, 1958	...	24	...	334	19,728,000	...
Arkansas, 1921	...	7,565	...	28,458	1,644,387,000	...
California, 1861	...	43,977	...	961,370	22,701,900,000	...
Colorado, 1867	...	6,479	...	83,436	1,584,454,000	...
Florida, 1943	...	92	...	15,545	603,674,000	...
Illinois, 1889	...	32,158	...	54,668	3,329,954,000	...
Indiana, 1889	...	7,525	...	8,219	515,000,000	...
Kansas, 1889	...	45,220	...	151,855	5,553,427,000	...
Kentucky, 1860	...	22,800	...	14,825	707,411,000	...
Louisiana, 1902	...	26,759	...	1,076,506	24,653,925,000	...
Michigan, 1900	...	5,064	...	53,904	1,086,675,000	...
Mississippi, 1889	...	2,879	...	74,063	2,221,033,000	...
Missouri, 1889	...	831	...	400	4,159,000	...
Montana, 1916	...	3,924	...	54,274	1,310,810,000	...
Nebraska, 1939	...	1,614	...	16,137	453,890,000	...
Nevada, 1954	...	45	...	10,992	30,586,000	...
New Mexico, 1011	...	18,167	...	184,238	5,515,247,000	...
New York, 1865	...	4,197	...	1,140	80,148,000	...
North Dakota, 1951	...	3,494	...	100,592	1,016,716,000	...
Ohio, 1860	...	30,142	...	27,419	982,006,000	...
Oklahoma, 1891	...	89,006	...	307,600	13,272,274,000	...
Pennsylvania, 1859	...	24,778	...	7,241	1,325,643,000	...
South Dakota, 1954	...	153	...	4,515	21,537,000	...
Tennessee, 1860	...	725	...	1,392	14,547,000	...
Texas, 1889	...	187,869	...	1,925,966	61,028,941,000	...
Utah, 1907	...	2,103	...	75,627	918,604,000	...
Virginia, 1943	...	23	...	41	570,000	...
West Virginia, 1860	...	15,945	...	5,871	558,143,000	...
Wyoming, 1894	...	11,468	...	284,534	5,661,855,000	...
Total United States		597,320		7,355,303	186,263,092,000	

*Discovery date indicates first year of production in state. There are 32,975 oil fields in the U.S.

VENEZUELA

PDVSA/ ZULIA						
Alturas	...	8	16	2,642	4,140,418	32.2
Bechaquero, 1930	10,720	1,302	1,507	245,929	6,631,194,318	22.9
Barua, 1928	...	11	19	1,091	31,975,134	20.8
Boscan, 1948	9,708	423	695	28,851	803,178,000	10.2
Cabimas, 1917	2,200	151	832	46,880	757,784,958	22.4
Centro, 1959	9,600-11,000	27	62	148,065	991,944,863	33.6
Caura	16,380	126	284	63,957	500,635,876	30.2
Cruces-Manuelitas, 1916	3,000-8,000	41	193	1,638	177,887,841	30.2
La Concepcion, 1953	3,148-8,000	50	189	7,693	139,718,456	30.1
La Paz, 1925	4,268-8,000	52	195	9,252	865,729,065	30.1
Lago, 1959	11,450	31	104	17,024	274,661,452	30.5
Lagunillas, 1926	3,000	1,737	2,235	361,093	11,086,650,262	22.0
Lama, 1957	8,320	201	376	135,629	7,679,286,645	32.2
Lamar, 1958	13,000	75	161	81,396	1,192,397,969	33.5
Mara, 1945	5,240	49	123	5,804	417,706,447	28.6
Mene Grande, 1914	4,130	184	779	340	637,755,243	19.9
Motatan, 1952	...	24	37	48,614	118,241,052	22.0
Sibucana, 1948	13,450	1	3	461	43,586,251	...
Sur del Lago	17,830	...	...	15,000	23,385,201	33.6
Tia Juana, 1928	3,000	1,899	2,194	141,300	4,110,081,045	17.9
Urdaneta, 1970	10,000	2	3	42,399	168,221,172	22.0
West-Tarra, 1942	4,250-5,500	14	46	2,128	74,780,333	30.2

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
			Producing	Total	1990 average b/d	Cumulative to Dec. 31, 1990 bbl	
PDVSA/ANZOATEGUI	Adjuntas, 1957	5,000	...	...	...	8,714,849	13.9
	Arecuna	1,300	89	121	4,955	12,806,234	11.0
	Bare	1,110	198	281	30,586	37,140,022	10.2
	Boca, 1971	9,500	7	63	697	9,289,018	32.2
	Caico Seco, 1946	6,500-7,300	1	16	243	35,541,370	31.8
	Chimire, 1948	7,000-7,200	17	89	2,550	301,080,007	31.1
	Dacion, 1957	6,700	79	155	8,179	232,212,117	23.0
	El Roble, 1939	3,500-11,500	26	70	2,081	43,867,479	49.3
	El Toco	2,300	30	47	1,437	16,046,619	23.7
	Elias, 1954	5,000-6,470	40	140	6,168	...	...
	Guara, 1946	5,000-10,000	97	276	11,262	260,716,728	27.0
	Guario, 1940	3,400	17	63	1,598	54,913,244	43.6
	Guico, 1944	4,500-7,000	14	67	1,450	68,306,067	25.4
	Inca, 1948	7,250	1	10	4,328	62,307,133	28.2
	Isla, 1954	...	23	74	...	...	40.5
	La Ceiba, 1946	9,450	20	39	2,223	50,547,336	41.9
	La Ceibita, 1963	9,878	16	57	1,816	83,981,042	42.0
	Leona, 1938	2,200-12,800	12	77	1,089	52,278,878	26.7
	Mata, 1954	8,970-10,516	51	410	7,166	474,216,931	35.9
	Merrey, 1937	5,400-5,700	20	47	1,061	35,459,301	12.5
	Nipa, 1945	8,000-8,500	18	133	2,288	201,028,308	29.6
	Oficina, 1937	5,900	39	195	717	383,319,088	26.1
	Decorate-Norte, 1952	9,513	12	83	1,473	113,562,318	24.2
	Plato Este, 1985	...	1	1	69	163,836	41.9
	San Joaquin, 1939	6,550	74	135	4,766	99,299,657	51.3
	Soto, 1950	9,500	14	103	768	94,229,440	...
	Sta. Ana, 1936	8,500	38	116	4,641	125,644,217	45.8
	Sta. Rosa, 1941	8,500	152	250	8,453	391,896,543	45.7
	Yopales, 1937	4,600	102	245	9,328	136,654,308	22.6
	Zanyas, 1958	13,270	9	20	1,668	41,350,164	38.1
	Zapatos, 1955	11,500	14	71	3,022	182,354,038	32.4
	Zorro, 1953	11,100	10	34	1,261	75,105,565	29.3
	Zulus, 1957	12,710	8	28	1,183	25,413,648	41.2
	Zumo, 1954	9,200	7	39	953	70,983,494	25.3
PDVSA/MONAGAS	Acema, 1960	...	58	136	11,618	61,638,039	26.4
	Acema-Casma	4,023	13	24	11,256	89,426,639	24.3
	Aguasay, 1955	8,100-13,400	10	60	2,658	100,281,653	41.3
	Aguasay Norte/Sur, 1955	4,849	8	24	1,002	23,765,381	42.4
	Carisito, 1984	4,881	7	8	3,791	7,682,047	41.7
	Carito, 1968	...	11	12	53,826	33,390,636	31.4
	Cerro Negro	1,200	18	143	5,233	26,650,628	9.0
	Fumal, 1986	...	4	4	132,946	129,833,355	26.3
	Jobo, 1956	3,600-4,000	137	472	21,185	290,626,707	10.3
	Josepin, 1938	4,253	3	483	15,696	203,577,118	26.5
	Marrasa, 1954	...	...	14	...	...	16.7
	Mata Acema, 1951	...	...	...	4,891	89,426,639	27.0
	Monchal, 1958	3,312	46	262	3,569	173,632,723	9.2
	Musipan, 1985	16,500	13	14	49,180	116,836,387	32.0
	Onado, 1971	4,791	5	26	961	20,705,619	28.0
	Oritupano, 1950	7,657	16	69	2,877	39,831,574	18.4
	Oritupano Norte/Sur, 1954	...	26	171	5,161	121,968,030	24.1
	Orocual, 1953	2,954	10	82	1,052	31,228,156	25.1
	Pilon, 1937	...	49	149	8,152	159,555,082	11.8
	Pirital, 1958	450-1,100	93	93	75,439	27,535,135	...
	Quinquere, 1928	7,000-7,200	...	...	1,075	761,694,081	27.7
	Sta. Barbara, 1941	5,020-6,500	2	375	29,542	164,751,780	31.4
	Tacat, 1953	1,820-3,670	...	140	...	45,743,457	...
	Temblador, 1936	3,500-4,500	11	139	1,299	110,095,951	18.7
PDVSA/BARINAS	Guafita, 1984	8,500	28	28	45,980	66,703,939	29.1
	Hato, 1965	9,550	11	18	2,444	45,416,992	22.7
	La Victoria, 1987	...	12	12	25,845	15,466,832	34.5
	Maporai, 1957	10,950	11	16	2,392	18,014,993	25.7
	Paez, 1963	...	49	67	7,860	69,765,021	19.9
	Silvan, 1948	10,860	17	22	2,266	51,672,015	26.8
	Silvestre, 1948	8,860	20	57	3,030	139,486,891	22.1
	Sinco, 1953	8,500-9,100	41	87	6,404	264,653,826	21.5
	Other	...	4	5	247	3,518,121	...
	Blarzo, 1959	...	3	6	184	2,455,211	24.0
PDVSA/GUARICO	Budare, 1958	4,523	26	50	8,503	75,378,636	31.1
	Jobal, 1960	...	8	14	129	2,247,025	33.8
	Las Mercedes, 1942	4,500	...	265	...	91,650,707	...
	Ruiz, 1949	4,500	...	67	...	33,189,614	...
	Saben, 1947	...	9	98	181	22,306,002	43.9
PDVSA/AMACURO	Tucupita, 1945	...	...	48	...	67,074,189	...
PDVSA/FALCON	All fields, 1920	...	...	...	...	108,212,457	27.4
Total Venezuela			8,425	17,388	2,084,538	44,381,464,276	
YEMEN	HUNT OIL						
	Al-Shura, 1989	7,600	3	4	2,000	756,000	40.0
	Al-R, 1984	5,750	54	96	154,400	176,445,000	40.0
	Al-Windiah, 1989	7,500	1	1	...	16,000	40.0

Name of field, discovery date	Depth, ft	No. of wells		Production		API gravity
		Producing	Total	1980 average b/d	Cumulative to Dec. 31, 1980 bbl	
Asa'ad Al-Kamil, 1987	6,100	17	31	10,100	3,685,000	40.0
Azal, 1987	6,850	10	16	20,600	21,513,000	40.0
Jabai, Nuqum, 1988	3,780	1	1	1,100	861,000	44.0
Saif Ben The-Yazen, 1988	7,600	1	2	1,100	882,000	40.0
Total Yemen		87	151	189,300	204,158,000	

YUGOSLAVIA

INA-
NAFTAPLINNAFTA-GAS^(e)

Baničanci, 1966	6,752-5,938	25	27	3,978	106,524,222	30.2
Biševac, 1966	3,346-5,052	37	50	680	8,007,806	40.8
Blizovac, 1969	5,483-5,499	2	7	223	113,644	33.8
Bokšić-Klokočević, 1975	7,218-10,171	8	9	61	257,280	31.0
Bunjani, 1951	1,800-2,550	21	27	91	2,547,471	30.2
Cmac, 1977	6,814-8,061	2	2	83	175,702	34.6
Deletovci, 1982	3,143-3,422	46	47	3,512	7,462,429	28.9
Dugo Selo, 1953	3,445-4,183	15	16	422	9,935,794	31.1
Ferdinandovac, 1959	5,625-5,915	5	6	104	1,325,177	36.0
Ilača, 1982	3,445-3,855	10	15	265	504,163	31.1
Ivanč Grad, 1959	5,282-5,709	46	47	3,415	45,386,388	33.4
Jagnjedovac, 1961	2,864-3,570	25	30	414	6,550,917	33.0
Jamnice, 1965	3,281-5,512	88	103	2,564	16,164,824	37.6
Ježevci, 1963	8,234-7,382	8	11	82	889,573	36.7
Kalinovac ⁽¹⁾ , 1978	11,841-14,682	14	19	6,982	7,800,225	51.5
Kloštar, 1952	2,297-4,593	74	82	968	40,777,483	36.3
Kozarica, 1972	3,281-3,609	19	20	401	1,779,235	23.6
Križ, 1948	1,600-2,250	30	50	89	6,527,336	17.4
Kučanci-Kapela, 1973	6,562-7,218	14	17	1,033	1,755,354	25.2
Laci, 1979	7,805-8,012	7	9	2,000	5,073,212	35.6
Lepevina, 1969	1,780-2,200	8	8	224	92,587	22.8
Lešani, 1989	4,584-4,817	5	5	135	88,875	35.0
Lipovljani, 1960	3,937-5,709	64	99	2,055	22,897,611	36.7
Lupoglav, 1971	3,960-5,600	5	5	100	176,782	33.4
Mihovljani, 1973	5,150-5,760	4	4	84	89,797	32.5
Molve ⁽²⁾ , 1974	10,263-11,345	17	20	958	2,528,703	57.2
Mramor Brdo, 1949	2,625-4,101	4	4	38	4,553,612	31.1
Obod, 1967	8,378-7,550	1	8	165	2,284,463	32.5
Okoli, 1962	7,382-8,366	4	4	375	675,904	35.5
Okoli ⁽³⁾ , 1962	7,218-7,874	10	15	505	1,014,940	80.6
Privlaka, 1963	2,933-3,041	13	17	1,124	1,793,385	25.9
Sandrovac, 1962	2,250-3,700	99	158	3,972	99,416,887	37.8
Star Gradac ⁽⁴⁾ , 1960	11,720-13,630	3	7	752	889,322	51.4
Števkovica, 1978	7,710-9,843	17	25	791	4,165,103	31.9
Struzac, 1956	2,362-3,773	60	81	5,385	103,267,756	38.8
Vezdole, 1965	6,135-6,562	8	5	18	54,867	31.6
Žutica, 1963	5,742-6,923	167	173	6,941	88,584,037	33.8
Other ⁽⁵⁾	5,250-11,800	17	21	231	654,136	87.9
Total Yugoslavia		1,645	2,358	63,910	729,455,142	

ZAIRE

CHEVRON

ZAIREF (FINA)

• GCO, 1970	7,000-9,000	5	13	174	6,458,377	38.7
• Libwa, 1981	5,500	3	3	1,553	585,157	33.0
• Lukami, 1983	12,400	6	9	1,383	7,905,246	33.2
• Mibale, 1973	5,000-6,000	5	5	9,176	92,349,447	30.0
• Motoba, 1976	11,098	9	9	7,383	8,215,914	31.5
• Mwamba, 1979	6,150	1	2	156	795,966	29.7
• Moko, 1972	12,310	1	1	424	154,253	32.0
East Mibale, 1978	6,000	...	1	...	397,000	34.0
Kifuku, 1983	3,400	1	1	14	56,088	31.0
Kinkasi, 1972	3,700	41	42	2,178	8,975,168	31.0
Liewenda, 1972	3,900	30	36	1,553	4,585,881	31.0
Makolokase, 1983	3,600	8	8	366	10,490,938	31.0
Muanda, 1972	3,600	6	7	349	948,495	31.0
Nsiamfumu, 1977	8,300	...	1	...	5,000	34.0
Tshienda, 1978	6,000	5	8	4,397	9,312,309	34.0
Total Zaire		121	146	29,118	151,215,169	



CRUDE OIL ASSAYS

Key to the assays . . .

Each assay is headed, in the following order, by the official name of the crude, the former or secondary name in parenthesis, the country of origin, and location and type loading facilities. Loading systems that frequently crop up are abbreviated. Those used are CBM (conventional buoy mooring), SPM (single point mooring), SBM (single buoy mooring), CALM (catenary anchor leg mooring), and SALM (single anchor leg mooring).

Mideast

Aboozar (Ardeshir), Iran

Terminal Kharg Island

Crude

Gravity, °API: 26.9
Sulfur, wt %: 2.48
Rvp, psi: 5.5
H₂S (dissolved) wt %: 0.031
H₂S (evolved) wt %: 0.089
Pour pt, °F.: -30
Salt, lb/1,000 bbl: 55.0
Neutralization value, mg KOH/g: 1.96
Rams. carbon, wt %: 5.9
Kin. vis., cSt @ 68° F.: 36.58
@ 122° F.: 12.76
V/Ni, ppm: 71/21
Light hydrocarbons, vol %: 3.86

Naphtha

Range (TBP), °F.: C₅-200
Yield, vol %: 5.5
Gravity, °API: 80.2
Sulfur (total) wt %: 0.090
Mercaptan S, wt %: 0.044
Rvp, psi: 10.3
Paraffins, vol %: 72.6
Naphthenes, vol %: 24.2
Aromatics, vol %: 3.1
RON, clear: 71.7
MON, clear: 67.9

Naphtha

Range (TBP), °F.: 200-320
Yield, vol %: 8.4
Gravity, °API: 55.7
Sulfur (total) wt %: 0.097
Mercaptan S, wt %: 0.027
Rvp, psi: 1.0
P/N/A, vol %: 60.1/27.3/12.7
RON, clear: 45.7
MON, clear: 44.3

Naphtha

Range (TBP), °F.: 320-360
Yield, vol %: 3.8
Gravity, °API: 48.6
Sulfur (total), wt %: 0.158
Mercaptan S, wt %: 0.023
P/N/A, vol %: 59.1/25.8/15.1
RON, clear: 30.2
MON, clear: 31.4

Kerosine

Range (TBP), °F.: 360-520
Yield, vol %: 14.4
Gravity, °API: 41.9
Sulfur (total), wt %: 0.452
Mercaptan S, wt %: 0.015
Aniline pt, °F.: 143.9
Diesel index: 60.2
Cetane index: 49.3
Freeze pt, °F.: -32
Cloud pt, °F.: -49
Pour pt, °F.: -52
Smoke pt, mm: 20

Gas oil

Range (TBP), °F.: 520-650
Yield, vol %: 12.7
Gravity, °API: 33.4
Sulfur (total), wt %: 1.274
Charac. factor: 11.74
Aniline pt, °F.: 158.8
Diesel index: 53.0
Cetane index: 52.7
Cloud pt, °F.: 21
Pour pt, °F.: 18
Vis., SUS @ 100° F.: 40.4
@ 122° F.: 37.1

Residue

Range (TBP), °F.: 650+
Yield, vol %: 53.5
Gravity, °API: 12.5
Sulfur (total), wt %: 3.804
Pour pt, °F.: 56
Rams. carbon, wt %: 10.0
Vis., SUS @ 122° F.: 12,303.9
@ 210° F.: 465.9
V/Ni, ppm: 120/36

Residue

Range (TBP), °F.: 1,050+
Yield, vol %: 24.2
Gravity, °API: 3.5
Sulfur (total), wt %: 5.069
Pour pt, °F.: 210
Rams. carbon, wt %: 19.6
Vis., SUS @ 210° F.: 125,012.7
V/Ni, ppm: 244/74

Abu Al Bu Khoosh, Abu Dhabi, U.A.E.

Storage tanker offshore producing area

Crude

Gravity, °API: 31.6
Sulfur, wt %: 2.0
Pour pt, °C.: -12 (-24.5° F.)

Kin. vis., 37.8° C. cSt: 6.7
Con. carbon, wt %: 4.3
Rvp, psi: 3.5
V/Ni, ppm: 12/7
Ibp-15° C. yield, wt %: 0.59
vol %: 0.69

Light naphtha

Range, °C.: 15-65
Yield, wt %: 2.74
vol %: 3.59
Gravity, °API: 88.7
Sulfur, wt %: 0.03
Mercaptans, ppm: 325
Paraffins, vol %: 95
Naphthenes, vol %: 4.4
Aromatics, vol %: 0.06
RON, clear: 74
RON + 3 ml TEL: 94.5

Heavy naphtha

Range, °C.: 65-165
Yield, wt %: 14.45
vol %: 16.83
Gravity, °API: 59.6
Sulfur, wt %: 0.05
Mercaptans, ppm: 276
P/N/A, vol %: 68.3/18.5/13.2

Kerosine

Range, °C.: 165-230
Yield, wt %: 11.52
vol %: 12.53
Gravity, °API: 46.25
Sulfur, wt %: 0.16
Mercaptans, ppm: 182
P/N/A, vol %: 55.5/21.8/22.7
Freezing pt, °C.: -52.5
Aniline pt, °C.: 56.4
Diesel index: 61.7
Smoke pt, mm: 23

Light gas oil

Range, °C.: 230-300
Yield, wt %: 12.5
vol %: 12.96
Gravity, °API: 37.6
Sulfur, wt %: 0.85
Pour pt, °C.: -27
Cloud pt, °C.: -19
Aniline pt, °C.: 65
Diesel index: 55.9
Kin. vis., cSt @ 37.8° C.: 2.63

Heavy gas oil

Range, °C.: 300-375
Yield, wt %: 13.83
vol %: 12.71
Gravity, °API: 30.3
Sulfur, wt %: 1.9
Pour pt, °C.: +2
Cloud pt, °C.: +7
Aniline pt, °C.: 72.2
Diesel index: 49.1
Kin. vis., cSt @ 37.8° C.: 6.92

Distillate

Range, °C.: 375-550
Yield, wt %: 26.63
vol %: 24.95
Gravity, °API: 21.4

Sulfur, wt %: 2.67
Pour pt, °C.: +26
Cloud pt, °C.: +28
Con. carbon, wt %: 0.7
Kin. vis., cSt @ 50° C.: 40.96
@ 98.9° C.: 7.89

Residue

Range, °C.: 375 +
Yield, wt %: 45.37
vol %: 40.69
Gravity, °API: 14.9
Sulfur, wt %: 3.4
Pour pt, °C.: +21
Asphaltenes, wt %: 3.1
V.Ni, ppm: 30.14
Kin. vis., cSt @ 50° C.: 435
@ 98.9° C.: 40.3

Residue

Range, °C.: 550 +
Yield, wt %: 18.7
vol %: 15.7
Gravity, °API: 4.3
Sulfur, wt %: 4.4
Pour pt, °C.: +50
Asphaltenes, wt %: 9.2
V.Ni, ppm: 67.35
Kin. vis., cSt @ 98.9° C.: 1,860
Pen. at 25° C.: 125

Arabian Heavy (Safaniya), Saudi Arabia

Ras Tanura

Crude

Gravity, °API: 27.9
Sulfur, wt %: 2.85
Pour pt, °F.: -20
Rvp, psi: 7.5
Kin. vis., cSt @ 70° F.: 37.0
@ 100° F.: 19.0

Light naphtha

Range, °FVT: 68-212
Yield, vol %: 7.9
Gravity, °API: 79.9
Sulfur, wt %: 0.0059
Rvp, psi: 8.5
Paraffins, vol %: 88.6
Naphthenes, vol %: 10.2
Aromatics, vol %: 1.2
RON, clear: 58.0

Heavy naphtha

Range, °FVT: 212-302
Yield, vol %: 6.8
Gravity, °API: 60.5
Sulfur, wt %: 0.016
P.N.A, vol %: 70.8/19.5/9.7

Kerosine

Range, °FVT: 302-455
Yield, vol %: 12.4
Gravity, °API: 48.4
Sulfur, wt %: 0.16
Aromatics, vol %: 18.9
Freeze pt, °F.: -67
Smoke pt, mm: 26
Luminometer no.: 57
Aniline pt, °F.: 141
Kin. vis., cSt @ -30° F.: 5.14
@ 100° F.: 1.14

Light gas oil

Range, °FVT: 455-650
Yield, vol %: 16.5
Gravity, °API: 35.2
Sulfur, wt %: 1.30
Pour pt, °F.: 5
Aniline pt, °F.: 154
Kin. vis., cSt @ 100° F.: 3.45
@ 210° F.: 1.30

Heavy gas oil

Range, °FVT: 650-1,049
Yield, vol %: 30.6

Gravity, °API: 20.9
Sulfur, wt %: 2.92
Pour pt, °F.: 95
Aniline pt, °F.: 173
Kin. vis., cSt @ 100° F.: 77.0
@ 210° F.: 8.46

Residual oil

Range, °FVT: 650 +
Yield, vol %: 53.8
Gravity, °API: 12.6
Sulfur, wt %: 4.34
Pour pt, °F.: 60
Con. carbon, wt %: 13.3
Kin. vis., cSt @ 275° F.: 4,103
@ 210° F.: 94.2

Residual oil

Range, °FVT: 1,049 +
Yield, vol %: 23.2
Gravity, °API: 3.0
Sulfur, wt %: 6.0
Pour pt, °F.: 120 +
Con. carbon, wt %: 27.7
Kin. vis., cSt @ 210° F.: 55,292
Furol, sec @ 275° F.: 1,309
V.Ni/Fe, ppm: 205/64/30

Arabian Light, Saudi Arabia

Ras Tanura and Yanbu also Sidon, Lebanon

Crude

Gravity, °API: 33.4
Sulfur, wt %: 1.79
Pour pt, °F.: -30
Rvp, psi: 3.6
Kin. vis., cSt @ 70° F.: 10.2
@ 100° F.: 6.25

Light naphtha

Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 78.4
Sulfur, wt %: 0.024
Rvp, psi: 8.2
Paraffins, vol %: 86.8
Naphthenes, vol %: 10.7
Aromatics, vol %: 2.5
RON, clear: 55.0

Heavy naphtha

Range, °FVT: 212-302
Yield, vol %: 8.5
Gravity, °API: 59.3
Sulfur, wt %: 0.027
P.N.A, vol %: 68.3/19.0/12.7

Kerosine

Range, °FVT: 302-455
Yield, vol %: 16.5
Gravity, °API: 48.0
Sulfur, wt %: 0.084
Aromatics, vol %: 20.6
Freeze pt, °F.: -71
Smoke pt, mm: 23
Luminometer no.: 51
Aniline pt, °F.: 138
Kin. vis., cSt @ -30° F.: 5.39
@ 100° F.: 1.13

Light gas oil

Range, °FVT: 455-650
Yield, vol %: 19.7
Gravity, °API: 36.5
Sulfur, wt %: 1.03
Pour pt, °F.: 5
Aniline pt, °F.: 158
Kin. vis., cSt @ 100° F.: 3.35
@ 210° F.: 1.30

Heavy gas oil

Range, °FVT: 650-1,049
Yield, vol %: 29.8
Gravity, °API: 22.9
Sulfur, wt %: 2.41

Pour pt, °F.: 95
Aniline pt, °F.: 180
Kin. vis., cSt @ 100° F.: 55.5
@ 210° F.: 6.89

Residual oil

Range, °FVT: 650 +
Yield, vol %: 44.6
Gravity, °API: 17.2
Sulfur, wt %: 3.1
Pour pt, °F.: 35
Con. carbon, wt %: 7.6
Kin. vis., cSt @ 100° F.: 414.3
@ 210° F.: 24.2

Residual oil

Range, °FVT: 1,049 +
Yield, vol %: 14.8
Gravity, °API: 6.9
Sulfur, wt %: 4.34
Pour pt, °F.: 115
Con. carbon, wt %: 20.3
Kin. vis., cSt @ 210° F.: 1,589
Furol, sec @ 275° F.: 104
V.Ni/Fe, ppm: 116/25/114

Arabian Light (Berri), Saudi Arabia

Ras Tanura

Crude

Gravity, °API: 37.8
Sulfur, wt %: 1.19
Pour pt, °F.: -25
Rvp, psi: 4.0
Kin. vis., cSt @ 70° F.: 5.80
@ 100° F.: 3.86

Light naphtha

Range, °FVT: 68-212
Yield, vol %: 10.1
Gravity, °API: 78.4
Sulfur, wt %: 0.071
Rvp, psi: 6.9
Paraffins, vol %: 87.4
Naphthenes, vol %: 11.2
Aromatics, vol %: 1.4
RON, clear: 50.0

Heavy naphtha

Range, °FVT: 212-302
Yield, vol %: 8.7
Gravity, °API: 58.2
Sulfur, wt %: 0.053
P.N.A, vol %: 65.3/20.4/14.3

Kerosine

Range, °FVT: 302-455
Yield, vol %: 18.7
Gravity, °API: 48.4
Sulfur, wt %: 0.090
Aromatics, vol %: 19.9
Freeze pt, °F.: -71
Smoke pt, mm: 25
Luminometer no.: 54
Aniline pt, °F.: 136
Kin. vis., cSt @ -30° F.: 4.79
@ 100° F.: 1.10

Light gas oil

Range, °FVT: 455-650
Yield, vol %: 21.2
Gravity, °API: 37.3
Sulfur, wt %: 0.72
Pour pt, °F.: 10
Aniline pt, °F.: 161
Kin. vis., cSt @ 100° F.: 3.4
@ 210° F.: 1.28

Heavy gas oil

Range, °FVT: 650-1,049
Yield, vol %: 30.3
Gravity, °API: 25.1
Sulfur, wt %: 1.83
Pour pt, °F.: 95
Aniline pt, °F.: 192
Kin. vis., cSt @ 100° F.: 44.4
@ 210° F.: 6.25

Residual oil

Range, °FVT: 650+
Yield, vol %: 39.3
Gravity, °API: 21.6
Sulfur, wt %: 2.09
Pour pt, °F: 70
Con. carbon, wt %: 4.2
Kin. vis., cSt (α 100° F.): 128.1
(α 210° F.): 12.34

Residual oil

Range, °FVT: 1,049+
Yield, vol %: 9.0
Gravity, °API: 11.0
Sulfur, wt %: 2.88
Pour pt, °F: 80
Con. carbon, wt %: 16.2
Kin. vis., cSt (α 210° F.): 396.9
Furol, sec (α 275° F.): 38.2
V/Ni, ppm: 9/6
Aromatics, ppm: 46

Arabian Medium (Khur-saniyah), Saudi Arabia

Ras Tanura**Crude**

Gravity, °API: 30.8
Sulfur, wt %: 2.40
Pour pt, °F: +5
Rvp, psi: 3.2
Kin. vis., cSt (α 70° F.): 16.2
(α 100° F.): 9.41

Light naphtha

Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 77.7
Sulfur, wt %: 0.043
Rvp, psi: 7.9
Paraffins, vol %: 85.3
Naphthenes, vol %: 12.3
Aromatics, vol %: 2.4
RON, clear: 54.5

Heavy naphtha

Range, °FVT: 212-302
Yield, vol %: 7.7
Gravity, °API: 59.1
Sulfur, wt %: 0.050
P.N.A, vol %: 68.5-18.8-12.7

Kerosine

Range, °FVT: 302-455
Yield, vol %: 14.5
Gravity, °API: 48.0
Sulfur, wt %: 0.14
Aromatics, vol %: 20.6
Freeze pt, °F: -62
Smoke pt, mm: 23
Luminometer no.: 52
Aniline pt, °F: 136
Kin. vis., cSt (α -30° F.): 5.10
(α 100° F.): 1.13

Light gas oil

Range, °FVT: 455-650
Yield, vol %: 18.1
Gravity, °API: 36.0
Sulfur, wt %: 1.24
Pour pt, °F: 15
Aniline pt, °F: 157
Kin. vis., cSt (α 100° F.): 3.53
(α 210° F.): 1.32

Heavy gas oil

Range, °FVT: 650-1,049
Yield, vol %: 30.9
Gravity, °API: 21.9
Sulfur, wt %: 2.91
Pour pt, °F: 100
Aniline pt, °F: 176
Kin. vis., cSt (α 100° F.): 49.2
(α 210° F.): 6.40

Residual oil

Range, °FVT: 650+

Yield, vol %: 49.6
Gravity, °API: 15.0
Sulfur, wt %: 3.90
Pour pt, °F: 55
Con. carbon, wt %: 9.9
Kin. vis., cSt (α 100° F.): 850
(α 210° F.): 36.0

Residual oil

Range, °FVT: 1,049+
Yield, vol %: 18.7
Gravity, °API: 4.9
Sulfur, wt %: 5.35
Pour pt, °F: 115
Con. carbon, wt %: 23.3
Kin. vis., cSt (α 210° F.): 3,847
Furol, sec (α 275° F.): 226
V/Ni/Fe, ppm: 96/32/30

Arabian Medium (Zuluf-Marjan), Saudi Arabia

Juayma**Crude**

Gravity, °API: 31.1
Sulfur, wt %: 2.48
Pour pt, °F: -20
Rvp, psi: 8.3
Kin. vis., cSt (α 70° F.): 19.4
(α 100° F.): 11.01

Light naphtha

Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 79.7
Sulfur, wt %: 0.0069
Rvp, psi: 9.1
Paraffins, vol %: 89.3
Naphthenes, vol %: 9.6
Aromatics, vol %: 1.1
RON, clear: 58.6

Heavy naphtha

Range, °FVT: 212-302
Yield, vol % on crude: 8.2
Gravity, °API: 60.2
Sulfur, wt %: 0.024
P.N.A, vol %: 69.3-20.2-10.5

Kerosine

Range, °FVT: 302-455
Yield, vol %: 14.1
Gravity, °API: 48.3
Sulfur, wt %: 0.14
Aromatics, vol %: 17.2
Freeze pt, °F: -72
Smoke pt, mm: 26
Luminometer no.: 59
Aniline pt, °F: 139
Kin. vis., cSt (α -30° F.): 5.01
(α 100° F.): 1.13

Light gas oil

Range, °FVT: 455-650
Yield, vol %: 17.6
Gravity, °API: 36.1
Sulfur, wt %: 1.25
Pour pt, °F: 10
Aniline pt, °F: 158
Kin. vis., cSt (α 100° F.): 3.45
(α 210° F.): 1.31

Heavy gas oil

Range, °FVT: 650-1,049
Yield, vol %: 28.2
Gravity, °API: 21.8
Sulfur, wt %: 2.90
Pour pt, °F: 95
Aniline pt, °F: 177
Kin. vis., cSt (α 100° F.): 72.6
(α 210° F.): 8.04

Residual oil

Range, °FVT: 650+
Yield, vol %: 48.0
Gravity, °API: 13.9
Sulfur, wt %: 4.06

Pour pt, °F: 55
Con. carbon, wt %: 9.4
Kin. vis., cSt (α 100° F.): 2,126
(α 210° F.): 65.9

Residual oil

Range, °FVT: 1,049+
Yield, vol %: 19.8
Gravity, °API: 3.9
Sulfur, wt %: 5.51
Pour pt, °F: 140
Con. carbon, wt %: 20.5
Kin. vis., cSt (α 210° F.): 20,085
Furol, sec (α 275° F.): 684
V/Ni/Fe, ppm: 179/54/40

Bahrgansar/Nowruz (SIRIP Blend), Iran

Ras Bahrgan SBM**Crude**

Gravity, °API: 27.1
Sulfur, wt %: 2.45
Pour pt, °C: -33
Vis., cSt (α 100° F.): 20.4
Con. carbon, wt %: 7.9
Rvp, kg/sq cm: 0.56
Salt, lb/1,000 bbl: 30.6
V/Ni, ppm: 72/25

Light naphtha

Range, °C: C₆-66
Yield, wt %: 3.76
Gravity, °API: 84.3
Sulfur, wt %: 0.065
Rvp, kg/sq cm: 0.87
Paraffins, vol %: 92.3
Naphthenes, vol %: 6.3
Aromatics, vol %: 1.4
RON, clear: 67.4

Heavy naphtha

Range, °C: 66-150
Yield, wt %: 8.59
Gravity, °API: 59.6
Sulfur, wt %: 0.06
P.N.A, vol %: 60.0-31.0-9.0
RON, clear: 48.0

Kerosine

Range, °C: 150-250
Yield, wt %: 13.23
Gravity, °API: 46.0
Sulfur, wt %: 0.228
Aromatics, vol %: 18.5
Freezing pt, °C: <-55
Smoke pt, mm: 22
Aniline pt, °C: 59.8

Gas oil

Range, °C: 250-350
Yield, wt %: 14.04
Gravity, °API: 33.6
Sulfur, wt %: 1.19
Pour pt, °C: -12
Aniline pt, °C: 69.2
Diesel index: 53.0

Residual oil

Range, °C: 350+
Yield, wt %: 59.00
Gravity, °API: 11.3
Sulfur, wt %: 3.8
Pour pt, °C: +12
Con. carbon, wt %: 13.35

Residual oil

Range, °C: 550+
Yield, wt %: 35.90
Gravity, °API: 4.4
Sulfur, wt %: 4.84
Pour pt, °C: >+48
Con. carbon, wt %: 21.85
V/Ni/Fe, ppm: 202/69/52

Note: Same assay first published in 1976.

Basrah Heavy, Iraq

Mina al Bakr sea terminal in Persian Gulf (Khor al Khafja)

Crude

Gravity, °API: 24.7
Sulfur, wt %: 3.5
Pour pt, °C: -30
Kin. vis. @ 10° C, cSt: 86.3
C₄ & lighter, wt %: 0.8

Light SR naphtha

Range, °C: C₅-65
Yield, wt %: 2.6
Density @ 15° C, g/cu m: 0.648
RON + 0.4 g Pb/l: 83

Heavy SR naphtha

Range, °C: 65-175
Yield, wt %: 12.2
Density @ 15° C, g/cu m: 0.74
RON + 0.4 g Pb/l: 55
Aromatics, vol %: 9.5
Naphthenes, vol %: 21

Kerosine

Range, °C: 175-222
Yield, wt %: 6.9
Density @ 15° C, g/cu m: 0.799
Sulfur, wt %: 0.38

Gas oil

Range, °C: 225-360
Yield, wt %: 21.6
Density @ 15° C, g/cu m: 0.871
Sulfur, wt %: 1.95
Pour pt, °C: -16
Cold filter pour pt, °C: -14
Kin. vis. cSt @ 100° C: 1.42

Heavy gas oil

Range, °C: 360-460
Yield, wt %: 13.5
Density @ 15° C, g/cu m: 0.935
Sulfur, wt %: 3.57
Kin. vis. cSt @ 100° C: 5.20

Long residuum

Range, °C: 360+
Yield, wt %: 55.9
Density @ 15° C, g/cu m: 1.012
Sulfur, wt %: 5.25
Kin. vis. cSt @ 100° C: 178.2

Short residuum

Range, °C: 460+
Yield, wt %: 42.4
Density @ 15° C, g/cu m: 1.041
Sulfur, wt %: 5.80
Kin. vis. cSt @ 100° C: 1.350
Con. carbon, wt %: 22.0
V/Ni, ppm: 212.26
Pen. @ 25° C, 0.1 mm: 180

Basrah Light, Iraq

Marine pipeline to Khor-al-Amaya piled structure in gulf

Crude

Gravity, °API: 33.7
Sulfur, wt %: 1.95
Pour pt, °C: -15
Kin. vis. cSt @ 10° C: 15.0
C₄ & lighter, wt %: 1.3

Light SR naphtha

Range, °C: C₅-65
Yield, wt %: 3.7
Density @ 15° C, g/cu m: 0.646
RON + 0.4 g Pb/l: 83

Heavy SR naphtha

Range, °C: 65-175
Yield, wt %: 16.2

Density @ 15° C, g/cu m: 0.737
RON + 0.4 g Pb/l: 54
Aromatics, vol %: 10
Naphthenes, vol %: 17

Kerosine

Range, °C: 175-225
Yield, wt %: 8.2
Density @ 15° C, g/cu m: 0.795
Sulfur, wt %: 0.10

Gas oil

Range, °C: 225-360
Yield, wt %: 22.9
Density @ 15° C, g/cu m: 0.843
Sulfur, wt %: 1.20
Pour pt, °C: -12
CFPP, °C: -9
Kin. vis. cSt @ 100° C: 1.35

Heavy gas oil

Range, °C: 360-525
Yield, wt %: 25.1
Density @ 15° C, g/cu m: 0.916
Sulfur, wt %: 2.41
Kin. vis. cSt @ 100° C: 8.00

Long residuum

Range, °C: 360+
Yield, wt %: 47.7
Density @ 15° C, g/cu m: 0.966
Sulfur, wt %: 3.60
Kin. vis. cSt @ 100° C: 38.5

Short residuum

Range, °C: 525+
Yield, wt %: 22.6
Density @ 15° C, g/cu m: 1.020
Sulfur, wt %: 4.70
Kin. vis. cSt @ 100° C: 760
Con. carbon, wt %: 18.5
V/Ni, ppm: 80/22

Basrah Medium, Iraq

Mina-al-Bakr sea terminal in Persian Gulf (Khor al Khafja)

Crude

Gravity, °API: 31.1
Sulfur, wt %: 2.58
Pour pt, °C: -30
Kin. vis. cSt @ 10° C: 41.0
C₄ & lighter, wt %: 1.6

Light SR naphtha

Range, °C: C₅-65
Yield, wt %: 3.3
Density, 15° C, g/cu m: 0.64
RON + 0.4 g Pb/l: 80

Heavy SR naphtha

Range, °C: 65-175
Yield, wt %: 14.9
Density @ 15° C, g/cu m: 0.736
RON + 0.4 g Pb/l: 54
Aromatics, vol %: 10.0
Naphthenes, vol %: 17

Kerosine

Range, °C: 175-225
Yield, wt %: 7.5
Density @ 15° C, g/cu m: 0.793
Sulfur, wt %: 0.23

Gas oil

Range, °C: 225-360
Yield, wt %: 22.3
Density @ 15° C, g/cu m: 0.849
Sulfur, wt %: 1.57
Pour pt, °C: -13
CFPP, °C: -10
Kin. vis. cSt @ 100° C: 1.44

Heavy gas oil

Range, °C: 360-520

Yield, wt %: 21.9

Density @ 15° C, g/cu m: 0.931
Sulfur, wt %: 3.08
Kin. vis. cSt @ 100° C: 8.74

Long residuum

Range, °C: 360+
Yield, wt %: 50.4
Density @ 15° C, g/cu m: 0.984
Sulfur, wt %: 4.38
Kin. vis. cSt @ 100° C: 61.7

Short residuum

Range, °C: 520+
Yield, wt %: 28.5
Density @ 15° C, g/cu m: 1.032
Sulfur, wt %: 5.43
Kin. vis. cSt @ 100° C: 1.400
Con. carbon, wt %: 19.0
V/Ni, ppm: 175/63
Pen. @ 25° C, 0.1 mm: 180

Belayim, Egypt

Wadi el Feiran, Gulf of Suez

Crude

Gravity, °API: 27.5
Sulfur, wt %: 2.20
Vis. cSt @ 20° C: 51.27
Pour pt, °C: +6
Wax content, wt %: 8.0
Rvp, psi: 6.50
Carbon residue, wt %: 7.25
V/Ni, ppm: 79.4/54.6
C₁-C₄, yield, vol %: 2.43

Naphtha

Range, °C: C₅-82
Yield, vol %: 5.12
RON, clear: 67.0
Ron + 0.4 Pb/l: 80.8

Naphtha

Range, °C: 82-160
Yield, vol %: 10.15
Paraffins, vol %: 57.0
Naphthenes, vol %: 33.0
Aromatics, vol %: 10.0
RON, clear: 47.2

Kerosine

Range, °C: 160-230
Yield, vol %: 9.36
Gravity, °API: 45.4
Total sulfur, wt %: 0.36
Smoke pt, mm: 24
Aromatics, vol %: 16.7

Gas oil

Range, °C: 230-350
Yield, vol %: 18.49
Gravity, °API: 34.0
Total sulfur, wt %: 1.47
Vis. cSt @ 20° C: 6.532
Pour pt, °C: -7
Aniline pt, °C: 69.2
Diesel index: 53.2

Vacuum distillate

Range, °C: 350-550
Yield, vol %: 26.94
Gravity, °API: 23.2
Total sulfur, wt %: 2.19
Vis. cSt @ 50° C: 36.24
Pour pt, °C: +39
Carbon residue, wt %: 0.65
Basic N, ppm: 540
Total N, ppm: 1,813

Residue

Range, °C: 350+
Yield, vol %: 54.45
Gravity, °API: 13.5
Total sulfur, wt %: 3.12
Vis. cSt @ 50° C: 1,508
Pour pt, °C: +30
Wax content, wt %: 13.7
Carbon residue, wt %: 12.10
V/Ni, ppm: 133.1/91.5

Burgan (Wafra), Divided Zone

Mina Saud, Divided Zone CBM, also Mina Abdulla, Kuwait

Crude

Gravity, °API: 23.3
Sulfur, wt %: 3.37
Pour pt, °F.: -5
Vis., Saybolt @ 122° F.: 134
Con. carbon, wt %: 7.7
Rvp, psi: 3.4
Salt content, lb/1,000 bbl: 17.5
V/Ni, ppm: 34/6.8

Light naphtha

Range, °F.: IBP-200
Yield, vol %: 3.20
Gravity, °API: 77.5
Sulfur, wt %: 0.01
Rvp, psi: 9.6
Paraffins, vol %: 74
Naphthenes, vol %: 25
Aromatics, vol %: 1
RON, clear: 73.1

Heavy naphtha

Range, °F.: 200-435
Yield, vol %: 13.62
Gravity, °API: 49.8
Sulfur, wt %: 0.15
Rvp, psi: 0.2
P/N/A, vol %: 44/36/20
RON, clear: 52.0
RON, + 3 g TEL: 68.0

Kerosine

Range, °F.: 435-500
Yield, vol %: 6.70
Gravity, °API: 38.5
Sulfur, wt %: 0.76
Aromatics, vol %: 37
Freezing pt, °F.: -47
Smoke pt, mm: 18
Aniline pt, °F.: 137.7
Cetane index: 47.3
ASTM, 50% pt, °F.: 456

Gas oil

Range, °F.: 500-620
Yield, vol %: 12.63
Gravity, °API: 32.7
Sulfur, wt %: 1.76
Pour pt, °F.: -5
Aniline pt, °F.: 153.3
Cetane index: 52.0

Residual oil

Range, °F.: 620 +
Yield, vol %: 63.45
Gravity, °API: 13.2
Sulfur, wt %: 4.45
Pour pt, °F.: +60
Con. carbon, wt %: 1.5

Residual oil

Range, °F.: 1,048 +
Yield, vol %: 34.23
Gravity, °API: 6.2
Sulfur, wt %: 5.43
Con. carbon, wt %: 20.3
V/Ni, ppm: 120/25

Dorrood (Darius), Iran

Kharg Island

Crude

Gravity, °API: 33.6
Sulfur, wt %: 2.35
Rvp, psi: 6.5
H₂S (evolved), wt %: 0.026
Pour pt, °F.: -4.5
Rams. carbon, wt %: 4.6

Kin. vis., cSt @ 100° F.: 5.65
V/Ni, ppm: 23/8
C₁-C₅, vol %: 6.35

Naphtha

Range (TBP), °F.: C₅-200
Yield, vol %: 10.1
Gravity, °API: 81.9
Sulfur, wt %: 0.067
Charac. factor: 12.70
Paraffins, vol %: 85.6
Naphthenes, vol %: 12.2
Aromatics, vol %: 2.2
RON/MON, clear: 61.7/61.1

Naphtha

Range (TBP), °F.: 200-320
Yield, vol %: 12.7
Gravity, °API: 59.0
Sulfur, wt %: 0.088
Charac. factor: 12.07
P/N/A, vol %: 67.5/17.8/14.8
RON/MON, clear: 33.0/35.9

Kerosine

Range, °F.: 320-520
Yield, vol %: 18.6
Gravity, °API: 44.9
Sulfur, wt %: 0.462
Charac. factor: 11.88
Aniline pt, °F.: 142.9
Diesel index: 64.1
Cetane index: 46.3
Freeze pt, °F.: -41
Cloud pt, °F.: -44
Pour pt, °F.: -49
Smoke pt, mm: 24
Naphthalenes, vol %: 2.66
Neut. no., mg Kott/g: 0.20
Vis., SUS @ 68° F.: 32.7

Gas oil

Range, °F.: 520-650
Yield, vol %: 11.5
Gravity, °API: 33.7
Sulfur, wt %: 1.68
Charac. factor: 11.76
Aniline pt, °F.: 162.3
Diesel index: 54.6
Cetane index: 49.9
Cloud pt, °F.: 26
Pour pt, °F.: 21
Vis., SUS @ 68° F.: 47.0

Residuum

Range, °F.: 650 +
Yield, vol %: 44.6
Gravity, °API: 14.5
Sulfur, wt %: 3.97
Pour pt, °F.: 58
Rams. carbon, wt %: 9.10
Vis., SUS @ 122° F.: 1,494.0
V/Ni, ppm: 45/16

Residuum

Range, °F.: 1,050 +
Yield, vol %: 17.9
Gravity, °API: 3.8
Sulfur, wt %: 5.38
Pour pt, °F.: 141
V/Ni, ppm: 101/36

Dubai (Fateh), Dubai, U.A.E.

SBMs in offshore Persian Gulf producing area

Crude

Gravity, °API: 31.05
Total sulfur, wt %: 2.0
Kin. vis., cSt @ 20° C.: 12.82
@ 40° C.: 7.05
Rvp, bar: 0.419
Pour pt, °C.: -9
Asphaltenes, wt %: 1.70
Con. carbon, wt %: 4.62
V/Ni, ppm: 42/14

Debutanized naphtha

Range, °C.: 15-145
Yield, vol %: 16.4
Gravity °API: 75.0
Vol % position in crude: 2.0-18.4
Total sulfur, ppm: 193
Rvp, bar: 0.44
Paraffins, vol %: 68.4
Naphthenes, vol %: 23.1
Aromatics, vol %: 8.5
RON, clear: 55.6

Kerosine

Range, °C.: 145-230
Yield, vol %: 15.0
Total sulfur, wt %: 0.25
P/N/A, vol %: 50.9/29.9/19.2
Smoke pt, mm: 22
Aniline pt, °C.: 56.0
Diesel index: 62.1
Cetane index: 56.0

Gas oil

Range, °C.: 145-350
Yield, vol %: 36.6
Gravity, °API: 38.6
Total sulfur, wt %: 1.04
Kin. vis., cSt @ 20° C.: 3.02
@ 40° C.: 1.99
Aniline pt, °C.: 60.8
Diesel index: 54.6
Cetane index: 51.0

Gas oil

Range, °C.: 175-400
Yield, vol %: 39.9
Gravity, °API: 34.1
Total sulfur, wt %: 1.43
UOP factor: 11.65

Residue

Range, °C.: 350 +
Yield, vol %: 45.0
Gravity, °API: 14.75
Total sulfur, wt %: 3.0
Kin. vis., cSt @ 50° C.: 351
@ 100° C.: 31.0
Pour pt, °C.: +19
Con. carbon, wt %: 9.1
V/Ni, ppm: 85/27

Dukhan (Qatar Land), Qatar

Umm Said terminal CBM & SBM

Crude

Gravity, °API: 41.7
Sulfur, wt %: 1.28
H₂S g/100 cc: 0.0283
Pour pt, °F.: -20
Rvp, psi: 11.7
Vis., SSU @ 80° F.: 43.3

Gasoline

Range, °F.: 40-155
Yield, vol %: 8.61
Gravity, °API: 86.5
Sulfur, wt %: 0.02
Paraffins, vol %: 95.0
Naphthenes, vol %: 3.9
Aromatics, vol %: 1.1

Light naphtha

Range, °F.: 155-265
Yield, vol %: 11.74
Gravity, °API: 64.3
Sulfur, wt %: 0.02
P/N/A, vol %: 67.8/19.7/12.5

Heavy naphtha

Range, °F.: 265-350
Yield, vol %: 10.65
Gravity, °API: 52.5
Sulfur, wt %: 0.03

P/N/A, vol %: 64.3/13.9/21.1
Dinaphthenes, vol %: 0.7
Smoke pt, calculated: 22.6

Kerosine

Range, °F.: 350-500
Yield, vol %: 15.83
Gravity, °API: 45.0
Cetane index (calculated): 51.1
Sulfur, wt %: 0.14
Aromatics, vol %: 21.1
Smoke pt: 21.0
Freeze pt, °F.: -42
Pour pt, °F.: -45

Heavy gas oil

Range, °F.: 500-650
Yield, vol %: 15.14
Cetane index (calculated): 55.1
Sulfur, wt %: 1.11
Total N, ppm: 35
Chloride, ppm: < 5.0
Pour pt, °F.: 15

Residue

Range, °F.: 650 +
Yield, vol %: 32.66
Gravity, °API: 20.3
Sulfur, wt %: 2.58
Vis., SSU @ 210° F.: 73.2

Residue

Range, °F.: 650-1,000
Yield, vol %: 22.79
Gravity, °API: 24.1
Sulfur, wt %: 2.15
Total N, ppm: 525
Rams carbon, wt %: 0.23
Vis., SSU @ 210° F.: 46.0

Pitch

Range, °F.: 1,000 +
Yield, vol %: 9.87
Sulfur, wt %: 3.45
Con. carbon, wt %: 12.75
V/Ni, ppm: 19.3

Eocene (Wafra), Divided Zone

*Mina Saud, Divided Zone
CBM, also Mina Abdulla, Kuwait*

Crude

Gravity, °API: 18.6
Sulfur, wt %: 4.55
Pour pt, °F.: -20
Vis., Saybolt 122° F.: 80.4
Con. carbon, wt %: 8.9
Rvp, psi: 1.1
Salt content, lb/1,000 bbl: 7.0

Light naphtha

Range, °F.: 1bp-200
Yield, vol %: 1.50
Gravity, °API: 77.6
Sulfur, wt %: 0.12
Rvp, psi: 11.4
Paraffins, vol %: 70
Naphthenes, vol %: 29
Aromatics, vol %: 1
RON, clear: 78.0
ASTM, 50% pt, °F.: 154

Heavy naphtha

Range, °F.: 200-435
Yield, vol %: 11.82
Gravity, °API: 51.0
Sulfur, wt %: 0.27
Rvp, psi: 1.4
P/N/A, vol %: 45/40/15
RON, clear: 48
RON, 3 g TEL: 60
ASTM, 50% pt, °F.: 325

Kerosine

Range, °F.: 435-500
Yield, vol %: 5.97
Gravity, °API: 36.9
Sulfur, wt %: 1.0
Aromatics, vol %: 30
Freezing pt, °F.: -66
Smoke pt, mm: 17
Aniline pt, °F.: 133.2
Cetane index: 43
ASTM, 50% pt, °F.: 458

Gas oil

Range, °F.: 500-620
Yield, vol %: 11.15
Gravity, °API: 31.0
Sulfur, wt %: 1.80
Pour pt, °F.: -30
Aniline pt, °F.: 145.8
Cetane index: 47
ASTM, 50% pt, °F.: 562

Residual oil

Range, °F.: 620 +
Yield, vol %: 68.03
Gravity, °API: 10.0
Sulfur, wt %: 4.9
Pour pt, °F.: 60
Con. carbon, wt %: 14.83

Residual oil

Range, °F.: 1,044 +
Yield, vol %: 39.75
Gravity, °API: 4.6
Sulfur, wt %: 6.1
Con. carbon, wt %: 22.5
V/Ni, ppm: 135/67

Foroozan (Fereidoon), Iran

Kharg Island

Crude

Gravity, °API: 31.3
Sulfur, wt %: 2.50
Rvp, psi: 5.7
H₂S (evolved), wt %: 0.015
Pour pt, °F.: -35
Neut. no., mg KOH/g: 0.70
Rams carbon, wt %: 5.4
Kin. vis., cSt @ 68°F.: 15.33
V/Ni, ppm: 36.11
C₁-C₅, vol %: 6.35

Naphtha

Range, °F.: C₅-200
Yield, vol %: 9.9
Gravity, °API: 82.6
Sulfur, wt %: 0.017
Charac. factor: 12.72
Paraffins, vol %: 76.8
Naphthenes, vol %: 21.8
Aromatics, vol %: 1.4
RON/MON, clear: 64.3/62.6

Naphtha

Range, °F.: 200-320
Yield, vol %: 10.5
Gravity, °API: 58.1
Sulfur, wt %: 0.056
Charac. factor: 12.02
P/N/A, vol %: 71.6/17.2/11.3
RON/MON, clear: 30.2/32.0

Kerosine

Range, °F.: 320-520
Yield, vol %: 17.7
Gravity, °API: 44.3
Sulfur, wt %: 0.435
Charac. factor: 11.84
Aniline pt, °F.: 145.2
Diesel index, °F.: 64.3
Cetane index: 45.4
Freeze pt, °F.: -41
Cloud pt, °F.: -52

Pour pt, °F.: -52
Smoke pt, mm: 22
Vis., SUS @ 68° F.: 32.4

Gas oil

Range, °F.: 520-650
Yield, vol %: 10.8
Gravity, °API: 33.4
Sulfur, wt %: 1.56
Charac. factor: 11.74
Aniline pt, °F.: 161.2
Diesel index: 53.8
Cetane index: 49.4
Cloud pt, °F.: 20
Pour pt, °F.: 19
Vis., SUS @ 68° F.: 48.0

Residue

Range, °F.: 650 +
Yield, vol %: 48.8
Gravity, °API: 13.6
Sulfur, wt %: 4.13
Pour pt, °F.: 34
Rams carbon, wt %: 9.86
Vis., SUS @ 122° F.: 3,616.0
V/Ni, ppm: 66/20

Residue

Range, °F.: 1,050 +
Yield, vol %: 20.4
Gravity, °API: 3.8
Sulfur, wt %: 5.6
Pour pt, °F.: 158
V/Ni, ppm: 143/44

Gulf of Suez Mix, Egypt

*Ras Shukheir/3 conventional
sea berths*

Crude

Gravity, °API: 31.9
Sulfur, wt %: 1.52
Rvp, psi: 8.3
Pour pt, °F.: 35
Rams carbon, wt %: 4.4
Kin. vis., cSt @ 100° F.: 8.74
V/Ni, ppm: 41/25
C₁-C₅, vol % yield: 5.48

Naphtha

Range (TBP), °F.: C₅-200
Yield, vol %: 7.8
Gravity, °API: 79.1
Total sulfur, wt %: 0.018
Rvp, psi: 10.7
Paraffins, vol %: 80.0
Naphthenes, vol %: 18.0
Aromatics, vol %: 2.0
RON, clear: 69.4
MON, clear: 66.1

Naphtha

Range (TBP), °F.: 200-320
Yield, vol %: 10.0
Gravity, °API: 56.7
Total sulfur, wt %: 0.022
Rvp, psi: 1.1
P/N/A, vol %: 57.3/32.7/10.1
RON, clear: 47.2
MON, clear: 43.9

Kerosine

Range (TBP), °F.: 320-520
Yield, vol %: 17.7
Gravity, °API: 42.6
Total sulfur, wt %: 0.395
Aniline pt, °F.: 138.6
Diesel index: 59.1
Cetane index: 43.0
Freeze pt, °F.: -48
Cloud pt, °F.: -42
Smoke pt, mm: 26
Naphthalenes, vol %: 2.88

Gas oil

Range (TBP), °F.: 520-650
Yield, vol %: 11.3
Gravity, °API: 33.9
Total sulfur, wt %: 1.2
Aniline pt., °F.: 159.1
Diesel index: 53.9
Cetane index: 50.21
Cloud pt., °F.: 26
Vis., SUS @ 68° F.: 49.8

Gas oil

Range (TBP), °F.: 650-850
Yield, vol %: 17.2
Gravity, °API: 27.2
Total sulfur, wt %: 1.6
Rams. carbon, wt %: 0.34

Residue

Range, °F.: 650 +
Yield, vol %: 50.8
Gravity, °API: 17.2
Total sulfur, wt %: 2.365
Rams. carbon, wt %: 7.90
Vis., SUS @ 122° F.: 1,146.9
V/Ni, ppm: 73/46

Hout, Divided Zone**Sea berth off Ras Al Khafji****Crude**

Gravity, °API: 32.8
Sulfur, wt %: 1.91
Rvp, psi: 4.6
Pour pt., °F.: -13.0
Kin. vis., cSt @ 86° F.: 9.88
Con. carbon, wt %: 5.01
Asphaltenes, wt %: 1.65
Wax content, wt %: 3.2
Neut. no., mg KOH/g: 0.04
C₁-C₄, vol %: 1.8
V/Ni, ppm: 28/6

Light naphtha

Range (TBP), °F.: C₅-176
Yield, vol %: 6.3
Gravity, °API @ 60° F.: 83.7
Sulfur, wt %: 0.029
H₂S, ppm: 19
Rvp, psi: 10.3
RON, clear: 64.6
RON + 3.0 ml TEL/gal: 84.2
MON, clear: 61.0
Paraffins, vol %: 92.6
Naphthenes, vol %: 6.4
Aromatics, vol %: 1.0

Full range naphtha

Range (TBP), °F.: C₅-374
Yield, vol %: 24.5
Gravity, °API: 63.5
Sulfur, wt %: 0.035
H₂S, ppm: 26
Rvp, psi: 4.3
RON, clear: 44.0
MON, clear: 43.6
Aniline pt., °F.: 134
P/N/A, vol %: 70.8/15.6/13.6

Kerosine

Range, °F.: 374-482
Yield, vol %: 11.3
Gravity, °API @ 60° F.: 44.5
Sulfur, wt %: 0.204
Pour pt., °F.: -49
Cloud pt., °F.: -49
Freeze pt., °F.: -42
Smoke pt., mm: 23.5
Aniline pt., °F.: 147
Saturates, vol %: 81.5
Aromatics, vol %: 18.0
Olefins, vol %: 0.5

Gas oil

Range, °F.: 482-644

Yield, vol %: 15.0
Gravity, °API @ 60° F.: 36.0
Sulfur, wt %: 1.07
Kin. vis. @ 100 °F.: 3.954
Pour pt., °F.: 14
Aniline pt., °F.: 163
Cetane index: 56.5

Residue

Range, °F.: 644 +
Yield, vol %: 47.4
Gravity, °API @ 60° F.: 16.4
Sulfur, wt %: 3.39
Kin. vis., cSt @ 122° F.: 360.3
Pour pt., °F.: 68
Con. carbon, wt %: 10.3
V/Ni, ppm: 58/13

Residue

Range, °F.: 1,022 +
Yield, vol %: 21.8
Gravity, °API @ 60° F.: 7.9
Sulfur, wt %: 4.39
Kin. vis., cSt @ 210° F.: 118.6
Pour pt., °F.: 91
Con. carbon, wt %: 20.7
Asphaltenes, wt %: 6.42
V/Ni, ppm: 110/31

Iranian Heavy, Iran**Kharg Island****Crude**

Gravity, °API: 31.0
Total sulfur, wt %: 1.65
Vis., cSt @ 70° F.: 16.84
Vis., cSt @ 100° F.: 9.36
Pour pt., °F.: -5
C₁-C₄ yield, vol %: 2.38

Gasoline

Range (TBP), °C.: C₅-65
Yield, vol %: 3.49
Sp. gr. 60/60° F.: 0.6468
RON, clear: 73.0
Paraffins, wt %: 93.5
Naphthenes, wt %: 5.7
Aromatics, wt %: 0.8

Light naphtha

Range, °C.: 65-149
Yield, vol %: 14.53
Sp. gr. 60/60° F.: 0.7392
Total sulfur, wt %: 0.088
P/N/A, wt %: 53.4/33.1/13.5

Heavy naphtha

Range, °C.: 149-262
Yield, vol %: 18.26
Sp. gr. 60/60° F.: 0.8041
Total sulfur, wt %: 0.289
Freezing pt., °C.: -50.0
Aromatics, vol %: 17.8
Aniline pt., °C.: 59.1
Smoke pt., mm: 23

Gas oil

Range, °C.: 262-352
Yield, vol %: 14.60
Total sulfur, wt %: 1.22
Cloud pt., °F.: 28
Pour pt., °F.: 24
Diesel index: 52

Residue

Range, °C.: 352 +
Yield, vol %: 46.74
Total sulfur, wt %: 2.55
Vis., cSt @ 122° F.: 614
Vis., cSt @ 210° F.: 49.8
Con. carbon, wt %: 9.9
Asphaltenes, wt %: 3.8
V/Ni, ppm: 139/58

Assay sample taken at production rate of 1.84 million b/d with following field contributions in b/d:

Ahwaz—700,000
Gachsaran—628,000
Bibi Hakimeh—269,000
Kharg, Kupal, Monsuri and Rag E. Safid—251,000

Iranian Light, Iran**Kharg Island****Crude**

Gravity, °API: 33.8
Pour pt., °F.: -20
Total sulfur, wt %: 1.35
Vis., cSt @ 70° F.: 10.58
@ 130° F.: 4.22

Gasoline

Range, °C.: C₅-65
Yield, vol %: 3.86
Sp. gr. 60/60° F.: 0.6465
RON, clear: 72.4
Paraffins, wt %: 94.4
Naphthenes, wt %: 4.8
Aromatics, wt %: 0.8

Light naphtha

Range, °C.: 65-149
Yield, vol %: 14.17
Sp. gr. 60/60° F.: 0.7387
Total sulfur, wt %: 0.040
P/N/A, wt %: 57.5/31.1/11.4

Heavy naphtha

Range, °C.: 149-262
Yield, vol %: 20.45
Sp. gr. 60/60° F.: 0.8028
Total sulfur, wt %: 0.198
Freezing pt., °C.: -49
Aromatics, vol %: 18.0
Aniline pt., °C.: 60.3
Smoke pt., mm: 24

Gas oil

Range, °C.: 262-352
Yield, vol %: 15.32
Sp. gr. 60/60° F.: 0.8599
Total sulfur, wt %: 1.05
Cloud pt., °F.: 28
Pour pt., °F.: 24
Diesel index: 53

Residue

Range, °C.: 352 +
Yield, vol %: 43.3
Sp. gr. 60/60° F.: 0.9531
Total sulfur, wt %: 2.42
Vis., cSt @ 122° F.: 297.0
@ 210° F.: 29.8
Con. carbon, wt %: 9.0
Asphaltenes, wt %: 1.2
V/Ni, ppm: 70/32

Assay sample taken at production rate of 2.6 million b/d with following field contributions in b/d:

Agha Jari—870,000
Marun—1.03 million
Karanj—356,000
Paris—279,000
Pazanan—33,000

Khafji, Divided Zone**Sea berth off Ras Al Khafji****Crude**

Gravity, °API: 28.5
Sulfur, wt %: 2.85

H₂S (dissolved), ppm: <1
Rvp, psi: 7.6
Pour pt, °F.: -31
Kin. vis., cSt @ 86° F.: 21.3
Con. carbon residue, wt %: 8.04
Asphaltenes, wt %: 4.32
Wax content, wt %: 2.7
Neut. no., mg KOH/g: 0.18
C₁-C₄, vol %: 3.41
V/Ni, ppm: 55/16

Light naphtha

Range (TBP), °F.: C₅-176
Yield, vol %: 5.5
Gravity, °API @ 60° F.: 85.2
Sulfur, wt %: 0.0028
Rvp, psi: 10.8
RON, clear: 66.2
RON + 1.0 ml TEL/gal: 78.5
MON, clear: 63.4
Paraffins, vol %: 93.9
Naphthenes, vol %: 5.4
Aromatics, vol %: 0.7

Full range naphtha

Range (TBP), °F.: C₅-374
Yield, vol %: 20.4
Gravity, °API @ 60° F.: 65.0
Sulfur, wt %: 0.0264
Rvp, psi: 4.3
RON, clear: 41.0
RON + 1 ml TEL/gal: 53.1
MON, clear: 41.2
Aniline pt, °F.: 139
P/Ni, vol %: 73.4/15.4/11.2

Kerosine

Range (TBP), °F.: 374-482
Yield, vol %: 9.5
Gravity, °API @ 60° F.: 44.5
Sulfur, wt %: 0.324
Cloud pt, °F.: -45
Freeze pt, °F.: -45
Smoke pt, mm: 23.7
Aniline pt, °F.: 145
Saturates, vol %: 80.5
Aromatics, vol %: 19.0
Olefins, vol %: 0.5

Gas oil

Range (TBP), °F.: 482-644
Yield, vol %: 13.9
Sulfur, wt %: 1.42
Kin. vis. @ 100° F.: 3.9
Pour pt, °F.: 10
Cloud pt, °F.: 10
Aniline pt, °F.: 156
Cetane index: 54.2

Residue

Range (TBP), °F.: 644+
Yield, vol %: 52.8
Gravity, °API @ 60° F.: 12.1
Sulfur, wt %: 4.46
Kin. vis., cSt @ 122° F.: 1,795
Pour pt, °F.: 50
Con. carbon, wt %: 13.4
Asphaltenes, wt %: 7.84
V/Ni, ppm: 95/28

Residue

Range (TBP), °F.: 991+
Yield, vol %: 27.8
Gravity, °API @ 60° F.: 4.5
Sulfur, wt %: 5.65
Kin. vis., cSt @ 210° F.: 6,043
Pour pt, °F.: 145
Con. carbon, wt %: 24.4
Asphaltenes, wt %: 15.4
V/Ni, ppm: 170/49

Kirkuk Blend, Iraq

*Mina-al-Bakr sea terminal in
Persian Gulf also Ceyhan
(Dortyol), Turkey*

Crude

Gravity, °API: 35.1
Sulfur, wt %: 1.97
Pour pt, °C.: -22
Kin. vis., cSt @ 10° C.: 12.8
C₄ & lighter, wt %: 1.8

Light SR naphtha

Range, °C.: C₅-65
Yield, wt %: 4.1
Density @ 15° C., g/cu m: 0.644
RON + 0.4 g Pb/l: 81

Heavy SR naphtha

Range, °C.: 65-175
Yield, wt %: 18.1
Density @ 15° C., g/cu m: 0.740
RON + 0.4 g Pb/l: 58.5
Aromatics, vol %: 10.5
Naphthenes, vol %: 22

Kerosine

Range, °C.: 175-225
Yield, wt %: 8.7
Density @ 15° C., g/cu m: 0.794
Sulfur, wt %: 0.19

Gas oil

Range, °C.: 225-360
Yield, wt %: 24.0
Density @ 15° C., g/cu m: 0.843
Sulfur, wt %: 1.18
Pour pt, °C.: -12
Cold filter pour pt, °C.: -9
Kin. vis., cSt @ 100° C.: 1.34

Heavy gas oil

Range, °C.: 360-525
Yield, wt %: 22.9
Density @ 15° C., g/cu m: 0.917
Sulfur, wt %: 2.35
Kin. vis., cSt @ 100° C.: 7.98

Long residuum

Range, °C.: 360+
Yield, wt %: 43.3
Density @ 15° C., g/cu m: 0.968
Sulfur, wt %: 3.76
Kin. vis., cSt @ 100° C.: 42.9

Short residuum

Range, °C.: 525+
Yield, wt %: 20.4
Density @ 15° C., g/cu m: 1.003
Sulfur, wt %: 5.30
Kin. vis., cSt @ 100° C.: 1,550
Con. carbon, wt %: 21.0
V/Ni, ppm: 142/54

Kuwait Export, Kuwait

Mina al Ahmadi

Crude

Gravity, °API: 31.4
Vis., SUV, sec @ 100° F.: 58.1
Pour pt, °F.: +5
Sulfur, wt %: 2.52
Ni/V (calc.), ppm: 8/30
Rvp, psi: 6.7
H₂S, wt %: <0.001
C₁-C₄ (GC analysis), vol %: 3.03

Naphtha

Range, °F.: Over point — 140
Yield, vol %: 3.80
Gravity, °API: 89.7
Sulfur, wt %: 0.04
RON (micro), clear: 71.8
RON + 3 ml TEL: 89.3

Naphtha

Range, °F.: 140-170
Yield, vol %: 2.26
Gravity, °API: 78.6
Sulfur, wt %: 0.02

Aniline pt, °F.: 147.7
RON, clear/ + 3 ml TEL: 58.2/80.40
Paraffins, vol %: 88.5
Monocycloparaffins, vol %: 9.9
Aromatics, total, vol %: 1.6

Heavy naphtha

Range, °F.: 170-310
Yield, vol %: 11.91
Gravity, °API: 62.1
Sulfur, wt %: 0.03
Aniline pt, °F.: 136.2
Paraffins, vol %: 70.1
Monocycloparaffins, vol %: 20.4
Dicycloparaffins, vol %: 0.4
Aromatics, total, vol %: 9.1

Kerosine

Range, °F.: 310-520
Yield, vol %: 18.43
Gravity, °API: 45.9
Pour pt, °F.: -45
Sulfur, wt %: 0.39
Aniline pt, °F.: 142.9
Cetane index: 53.8
Smoke pt, mm: 26

Heating oil

Range, °F.: 520-680
Yield, vol %: 14.89
Gravity, °API: 32.9
Vis., SUV, sec @ 100° F.: 43.3
Pour pt, °F.: +20
Total N, ppm: 100
Sulfur, wt %: 1.98
Aniline pt, °F.: 160.2
Cetane index: 54.3

Gas oil

Range, °F.: 680-1,000
Yield, vol %: 24.09
Gravity, °API: 21.4
Pour pt, °F.: +100
Sulfur, wt %: 3.12
Total N, ppm: 900
Ni/V, ppm: <0.1/<0.1
Vis., SUV, sec @ 130° F.: 175.2
Rams. carbon residue, wt %: 0.47

Residuum

Range (VEFV), °F.: 1,000+
Yield, vol %: 21.78
Gravity, °API: 5.8
Sulfur, wt %: 5.11
V/Ni, ppm: 116/34
Vis., SUV, sec @ 250° F.: 3,394
Rams. carbon residue, wt %: 21.9

Mubarek, Sharjah, U.A.E.

Floating storage and loading facility in offshore producing area

Crude

Gravity, °API: 37
Sulfur, wt %: 0.62
Rvp, psi: 4.8
Pour pt, °F.: 10
Salt, lb/1,000 bbl: 23
Vis., cSt @ 100° F.: 3.20
@ 122° F.: 2.80
Gas, vol % of crude: 0.7

Light straight run

Range, °F.: ibp-220
Yield, vol %: 12.7
Octane, F-1 clear: 68.2
Gravity, °API: 72.2
Rvp, psi: 11.8
Sulfur, wt %: 0.01

Light naphtha

Range, °F.: 220-300
Yield, vol %: 9.1
Paraffins, vol %: 51.6
Naphthenes, vol %: 30.4
Aromatics, vol %: 18.0
Octane, F-1 clear: 50.5
Gravity, °API: 55.2
Sulfur, wt %: 0.01

Heavy naphtha

Range, °F.: 300-360
Yield, vol %: 7.2
P/N/A, vol %: 48.5/28.8/22.7
Gravity, °API: 49.9
Sulfur, wt %: 0.01

Kerosine

Range, °F.: 360-500
Yield, vol %: 17.6
Gravity, °API: 42.7
Smoke pt, mm: 25
Aniline pt, °F.: 134
Diesel index: 57.2
Pour pt, °F.: -55
Sulfur, wt %: 0.04
Vis., cSt @ 100° F.: 1.40

Light gas oil

Range, °F.: 500-700
Yield, vol %: 21.4
Gravity, °API: 32.6
Aniline pt, °F.: 156
Diesel index: 50.9
Pour pt, °F.: 20
Rams. carbon residue, wt %: 0.66
Sulfur, wt %: 0.66
Vis., cSt @ 100° F.: 4.55
@ 210° F.: 1.54
Bromine no.: 0.6

Residuum

Range, °F.: 700+
Yield, vol %: 30.8
Gravity, °API: 19.6
Rams. carbon residue, wt %: 4.74
Sulfur, wt %: 1.18

Residuum

Range, °F.: 1,000+
Yield, vol %: 9.2
Gravity, °API: 12.2
Rams. carbon residue, wt %: 15.09
Sulfur, wt %: 1.43
V/Ni, ppm: 11.40/6.0

Murban, Abu Dhabi**Port of Jebel Dhanna/4 CBM berths****Crude**

Gravity, °API: 40.45
Rvp @ 37.8° C., psia: 3.46
Pour pt, °C.: -24
Kin. vis., cSt @ 40° C.: 2.70
Sulfur, wt %: 0.78
V/Ni, ppm: <0.1/0.7
Con. carbon, wt %: 1.35
Charac. factor, K_{app} : 12.1

Naphtha

Range (TBP), °C.: 20-165
Yield, vol %: 27.4
Position on crude, vol %: 1.9-29.3
Gravity, °API: 63.47
Sulfur, ppm: 43
RON, clear: 50

Naphtha

Range (TBP), °C.: 20-180

Yield, vol %: 31.2
Position on crude, vol %: 1.9-33.1
Gravity, °API: 61.48
Sulfur, ppm: 64
RON, clear: 47

Kerosine

Range (TBP), °C.: 150-220
Yield, vol %: 16.6
Position on crude, vol %: 25.3-41.9
Gravity, °API: 18.22
Smoke pt, mm: 24
Freeze pt, °C.: -46
Aromatics, vol %: 21
Aniline pt, °C.: 55.2
Sulfur, wt %: 0.022

Diesel

Range (TBP), °C.: 220-350
Yield, vol %: 26.0
Gravity, °API: 37.37
Sulfur, wt %: 0.62
Cloud pt, °C.: -12
Pour pt, °C.: -12
Vis., cSt @ 100° C.: 1.25
Aniline pt, °C.: 72.3
Diesel index: 60.6
Cetane index: 60
Con. carbon on 10% residue, wt %: <0.01

Residuum

Range (TBP), °C.: 350+
Yield, vol %: 32.1
Gravity, °API: 22.72
Sulfur, wt %: 1.73
Vis., cSt @ 100° C.: 10.85
Con. carbon, wt %: 4.3
Asphaltenes, wt %: 0.15
Pour pt, °C.: +33
V/Ni, ppm: 0.4/2.0
Flash pt, °C.: 214
Nitrogen, wt %: 0.125

Residuum

Range (TBP), °C.: 540+
Yield, vol %: 9.3
Gravity, °API: 13.99
Sulfur, wt %: 2.20
Vis., cSt @ 50° C.: 3,340
Con. carbon, wt %: 11.5
Asphaltenes, wt %: 0.74

Oman Export, Oman**Mina al Fahal****Crude**

Gravity, °API: 36.3
Sulfur, wt %: 0.79
Pour pt, °F.: -15
Rvp, psi: 4.2
Vis., SUS @ 60° F.: 64.8
Yield, ibp to 113 °F., vol %: 3.63

Fraction yields (partial)

Range/vol %:
390-450/6.73
450-500/5.74
500-550/5.64
550-650/10.76

Straight run

Range, °F.: 113-220
Yield, vol %: 7.54
Gravity, °API: 70.4
RON + 3 cc Pb: 74.2
Sulfur, wt %: 0.0
Paraffins, vol %: 77.0
Naphthenes, vol %: 18.24
Aromatics, vol %: 4.8

Naphtha

Range, °F.: 220-390
Yield, vol %: 17.77
Gravity, °API: 55.3
Sulfur, wt %: 0.03
P/N/A, vol %: 67.6/21.3/10.1
Dinaphthenes, vol %: 1.0

Kerosine

Range, °F.: 315-500
Yield, vol %: 20.56
Gravity, °API: 46.5
Sulfur, wt %: 0.12
Aromatics, vol %: 12.9
Smoke pt, mm: 26
Freeze pt, °F.: -56
Pour pt, °F.: -70

Light gas oil

Range, °F.: 450-650
Yield, vol %: 22.14
Gravity, °API: 37.5
Cetane index: 57.0
Sulfur, wt %: 0.42
Total N, ppm: 31
Aniline pt, °F.: 168.3
Pour pt, °F.: -15

Heavy gas oil

Range, °F.: 650-1,000
Yield, vol %: 26.15
Gravity, °API: 26.8
Sulfur, wt %: 0.98
Total N, ppm: 516
Pour pt, °F.: 70
Carbon residue, wt %: 0.14

Flashed residue

Range, °F.: 1,000+
Yield, vol %: 16.03
Gravity, °API: 14.2
Sulfur, wt %: 1.96
Vis., SSF @ 210 °F.: 196.0

Qatar Marine, Qatar**Halul Island****Crude**

Gravity, °API: 35.3
Sulfur, wt %: 1.57
Pour pt, °F.: 10
H₂S g/100 cc: 0.0315
Vis., SSU @ 60° F.: 53.4

Light straight run

Range, °F.: 40-155
Yield, vol %: 6.45
Gravity, °API: 82.5
Sulfur, wt %: 0.05
P/N/A, vol %: 88.7/9.5/1.7

Light naphtha

Range, °F.: 155-265
Yield, vol %: 9.45
Sulfur, wt %: 0.03
Paraffins, vol %: 60.6
Naphthenes, vol %: 23.3
Aromatics, vol %: 16.1

Heavy naphtha

Range, °F.: 265-350
Yield, vol %: 10.07
Gravity, °API: 51.8
Sulfur, wt %: 0.04
P/N/A: 56.7/18.5/22.9
Dinaphthenes, vol %: 1.9

Kerosine

Range, °F.: 350-500
Yield, vol %: 16.28
Gravity, °API: 43.1
Cetane index (calculated): 47.5
Sulfur, wt %: 0.18
Aromatics, vol %: 24.0
Smoke pt, mm: 19.0
Freeze pt, °F.: -44
Pour pt, °F.: -50

Heavy gas oil
Range, °F.: 500-650
Yield, vol %: 15.50
Cetane index (calculated): 51.6
Sulfur, wt %: 1.24
Total N, ppm: 72
Pour pt, °F.: 25

Residue
Range, °F.: 650+
Yield, vol %: 39.53
Gravity, °API: 16.5
Sulfur, wt %: 2.73
Vis., SUS @ 210° F.: 121.5

Residue
Range, °F.: 1,000+
Yield, vol %: 19.33
Gravity, °API: 10.3
Sulfur, wt %: 3.4
Con. carbon, wt %: 12.5
V/Ni, ppm: 31/7

Rostam, Iran

Lavan Island terminal

Crude
Gravity, °API: 35.9
Vis., cSt @ 50° C.: 3.08
Pour pt, °C.: -22.5
Sulfur, wt %: 1.55
NaCl, wt%: 0.036

Gasoline
Range, °F.: 1bp-165
Yield, vol %: 24.2
RON, clear: 61.4

Kerosine
Range, °C.: 165-220
Yield, vol %: 11.2

Gas oil
Range, °C.: 220-310
Yield, vol %: 17.3

Residuuum
Yield, vol %: 45.8
Pour pt, °C.: +12.5
Sulfur, wt %: 2.82
Carbon, wt %: 6.25

Note: Same assay first published in 1976.

Salmon (Sassan), Iran*

Levan Island

Crude
Gravity, °F.: 33.9
Paraffin, wt%: 1.9
Sulfur, wt %: 1.91
Pour pt, °F.: -5
Vis., SUS @ 77° F.: 52.1
@ 100° F.: 44.2
Bs&w: 17,550

Straight-run gasoline
Range, vapor-cut points, °F.: 50-200
Yield, vol %: 10.5
Gravity, °API: 77.6
Sulfur, wt %: 0.081
Mercaptan sulfur: 0.067
Octane no., F-1 clear: 61.0

Naphtha
Range, VCP, °F.: 200-375
Yield, vol %: 16.4
Gravity, °API: 53.3
Sulfur, wt %: 0.0820

Mercaptan S, wt %: 0.002
Aniline pt, °F.: 121.5
Octane no., F-1 clear: 35.4
Arom. + naphthenes, vol %: 41

Kerosine
Range VCP, °F.: 375-450
Yield, vol %: 7.5
Gravity, °API: 45.1
Sulfur, wt %: 0.19
Freezing pt, °F.: -50
Aniline pt, °F.: 137.9
Smoke pt, mm: 20
Kin. vis., cSt @ 60° F.: 2.05
@ 100° F.: 30

Gas oil
Range VCP, °F.: 450-700
Yield, vol %: 23.8
Gravity, °API: 34.1
Sulfur, wt %: 1.2
Pour pt, °F.: +15
Aniline pt, °F.: 153.3
Kin. vis., cSt @ 60° F.: 7.52
@ 100° F.: 4.03
Cetane no.: 56.3

Residual oil
Range VCP, °F.: 700+
Yield, vol %: 39.7
Gravity, °API: 15.3
Sulfur, wt %: 3.5
Pour pt, °F.: +75
Vis., SUS @ 210° F.: 154
@ 275° F.: 67.8
V + Ni, ppm: 44

Residual oil
Range, VCP, °F.: 1,070+
Yield, vol %: 12.0
Gravity, °API: 1.3
Sulfur, wt %: 5.0
Vis., SUS @ 210° F.: 8,000
@ 275° F.: 1,000
V + Ni, ppm: 127

* New assay not available. This one first published in OGJ in 1976. Sassan is produced from same reservoir as Abu Al Bu Khoosh.

Sirri, Iran

Offshore terminal in Persian Gulf producing area

Crude
Gravity, °API: 30.9
Kin. vis., cSt @ 10° C.: 20.3
@ 37.8° C.: 7.36
Pour pt, °C.: -9
Total sulfur, wt %: 2.3
Rvp, bars: 0.650
Paraffins, wt %: 3.43
Asphaltenes, wt %: 1.48
V/Ni/Fe, ppm: 41/12/3
Yield C₁-C₅, vol %: 7.14

Light gasoline
Range, °C.: C₅-80
Yield, vol %: 5.19
RON, clear: 64.1
Total sulfur, wt %: 0.0080

Heavy gasoline
Range, °C.: 80-180
Yield, vol %: 15.28
Paraffins, vol %: 59.0
Naphthenes, vol %: 30.0
Aromatics, vol %: 11.0
Sulfur, wt %: 0.078

Kerosine
Range, °C.: 180-225
Yield, vol %: 7.54
Smoke pt, mm (150°-225° C.): 18.50
Sulfur, wt %: 0.436

Gas oil
Range, °C.: 180-350
Yield, vol %: 29.61
Pour pt, °C.: -21
Total sulfur, wt %: 1.42
Aniline pt, °C.: 62.2
Diesel index (calculated): 51.9

Residue
Range, °C.: 350+
Yield, vol %: 46.33
Pour pt, °C.: +21
Kin. vis., cSt @ 50° C.: 375
@ 70° C.: 120
Total sulfur, wt %: 3.65
Asphaltenes, wt %: 3.01
Con. carbon, wt %: 9.53
V/Ni/Fe, ppm: 70/20/4

Soroosh (Cyrus), Iran

Offshore terminal with SBM in production area

Crude
Gravity, °API: 18.1
Sulfur, wt %: 3.3
Rvp, psi: 0.3
H₂S (evolved), wt %: 0.007
Pour pt, °F.: 10
Neut. no., mg KOH/g: 0.50
Rams. carbon, wt %: 12.2
Kin. vis., cSt @ 68° F.: 1,381.4
V/Ni, ppm: 101/35
C₁-C₅, vol %: 1.32

Naphtha
Range, °F.: C₅-200
Yield, vol %: 3.3
Gravity, °API: 77.3
Sulfur, wt %: 0.008
Charac. factor: 12.49
Paraffins, vol %: 69.1
Naphthenes, vol %: 29.7
Aromatics, vol %: 1.1
RON/MON, clear: 73.5/70.6

Naphtha
Range, °F.: 200-320
Yield, vol %: 5.1
Gravity, °API: 57.8
Sulfur, wt %: 0.021
Charac. factor: 12.00
P/N/A, vol %: 49.0/42.2/8.8
RON/MON, clear: 49.9/50.5

Kerosine
Range, °F.: 320-520
Yield, vol %: 11.6
Gravity, °API: 42.5
Sulfur, wt %: 0.37
Charac. factor: 11.76
Aromatics, vol %: 15.7
Aniline pt, °F.: 140.8
Diesel index: 59.8
Cetane index: 44.6
Freeze pt, °F.: -46
Cloud pt, °F.: -41
Pour pt, °F.: -55
Smoke pt, mm: 25
Neut no., mg KOH/g: 0.10
Vis., SUS @ 68° F.: 32.6

Gas oil
Range, °F.: 520-650
Yield, vol %: 9.6
Gravity, °API: 33.0
Sulfur, wt %: 1.19
Charac. factor: 11.72
Aniline pt, °F.: 152.9
Diesel index: 50.5

Cetane index: 49.0
Cloud pt, °F.: 11
Pour pt, °F.: 6
Naphthalenes, vol %: 13.68
Vis., SUS @ 68 °F.: 47.9

Residuum
Range, °F.: 650+
Yield, vol %: 70.1
Gravity, °API: 9.2
Sulfur, wt %: 4.3
Pour pt, °F.: 99
Rams. carbon, wt %: 16.31
Vis., SUS @ 210° F.: 1,439.8
V/Ni, ppm: 135/47

Residuum
Range, °F.: 1,050 +
Yield, vol %: 36.5
Gravity, °API: -0.2
Sulfur, wt %: 5.6
Pour pt, °F.: 213
V/Ni, ppm: 237/82

Souedie, Syria

Tartus/CBMs

Crude
Gravity, °API: 24.9
Sulfur, wt %: 3.82
Pour pt, °C.: -30
Kin. vis. @ 10° C.: 88.3
C₁₀ & lighter: 0.8

Light SR naphtha
Range, °C.: C₅-65
Yield, wt %: 3.2
Density @ 15° C., g/cu cm: 0.647
RON + 0.4 g Pb/l: 79.5

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 13.1
Density @ 15° C., g/cu m: 0.734
RON + 0.4 g Pb/l: 58
Naphthenes, vol %: 18
Aromatics, vol %: 10.5

Kerosine
Range, °C.: 175-225
Yield, wt %: 6.0
Density @ 15° C., g/cu m: 0.798
Sulfur, wt %: 0.38

Gas oil
Range, °C.: 225-360
Yield, wt %: 19.7
Density @ 15° C., g/cu m: 0.865
Sulfur, wt %: 2.50
Pour pt, °C.: -14
CFPP, °C.: -11
Kin. vis., cSt @ 100° C.: 1.40

Heavy gas oil
Range, °C.: 360-425
Yield, wt %: 9.8
Density @ 15° C., g/cu m: 0.925
Sulfur, wt %: 3.90
Kin. vis., cSt @ 100° C.: 4.3

Long residuum
Range, °C.: 360 +
Yield, wt %: 57.2
Density @ 15° C., g/cu m: 1.015
Sulfur, wt %: 5.90
Kin. vis., cSt @ 100° C.: 330.0

Short residuum
Range, °C.: 425 +
Yield, wt %: 47.4
Density @ 15° C., g/cu m: 1.040
Sulfur, wt %: 6.0
Kin. vis., cSt @ 100° C.: 1,800
Con. carbon residue, wt %: 21.5
V/Ni, ppm: 185/60

Umm Shaif (Abu Dhabi Marine), Abu Dhabi

Das Island

Crude
Gravity, °API: 37.4
Sulfur, wt %: 1.51
Pour pt, °C.: -30
Rvp @ 37.8° C., psia: 7.05
H₂S, ppm: <2
Asphalt, wt %: 0.13

Light naphtha
Range (TBP), °C.: C₅-80
Yield, vol %: 8.2
Gravity, °API: 83.1
Charac. factor K: 12.73
Sulfur, ppm: 1,030
RON, clear: 65
RON + 1.5 ml/v.s. gal TEL: 74.5
MON, clear: 61

Heavy naphtha
Range (TBP), °C.: 80-150
Yield, vol %: 13.7
Gravity, °API: 59.26
Sulfur, wt %: 0.052

Kerosine
Range (TBP), °C.: 150-230
Yield, vol %: 15.8
Gravity, °API: 47.53
Freeze pt, °C.: -53.0
Aniline pt, °C.: 54.6
Aromatics, vol %: 21.0
Smoke pt, mm: 23.0
Sulfur, wt %: 0.095

Diesel
Range (TBP), °C.: 230-375
Yield, vol %: 25.8
Gravity, °API: 34.49
Sulfur, wt %: 1.18
Pour pt, °C.: -12
Aniline pt, °C.: 69.6
Diesel index: 54.8
Cetane index: 51.2

Residue
Range (TBP), °C.: 350 +
Yield, vol %: 37.4
Gravity, °API: 19.1
Kin. vis., cSt @ 50° C.: 104.7
Pour pt, °C.: +27
Sulfur, wt %: 2.78
Asphaltenes, wt %: 0.1
Con. carbon, wt %: 5.3
V/Ni, ppm: 7.1/1.9

Residue
Range (TBP), °C.: 550 +
Yield, vol %: 12.3
Gravity, °API: 10.15
Kin. vis., cSt @ 100° C.: 315
Pour pt, °C.: +21
Sulfur, wt %: 3.73
Asphaltenes, wt %: 0.24
Con. carbon, wt %: 14.4
V/Ni, ppm: 19.0/5.0

Zakum (Lower Zakum/ Abu Dhabi Marine), Abu Dhabi

Das Island

Crude
Gravity, °API: 40.6
Rvp @ 37.8° C., psia: 8.37
Pour pt, °C.: -21

Kin. vis., cSt @ 20° C.: 4.28
Sulfur, wt %: 1.05
Charac. factor, K_{uop}: 12.28
Asphaltene content, wt %: 0.05

Light straight run
Range (TBP), °C.: C₅-80
Yield, vol %: 8.6
Gravity, °API: 82.7
Rvp @ 100 °F., psia: 11.6
Sulfur, ppm: 1.5
RON, clear: 66
MON, clear: 64

Naphtha
Range (TBP), °C.: C₅-160
Yield, vol %: 25.60
Gravity, °API: 66.5
Sulfur, ppm: 16.0

Kerosine
Range (TBP), °C.: 160-250
Yield, vol %: 18.8
Gravity, °API: 46.15
Kin. vis., cSt @ -20° C.: 4.10
Freeze pt, °C.: -48
Aniline pt, °C.: 58
Aromatics, vol %: 21.7
Smoke pt, mm: 23.5
Sulfur wt %: 0.063

Diesel
Range (TBP), °C.: 190-343
Yield, vol %: 29.30
Gravity, °API: 39.52
Sulfur, wt %: 0.52
Cloud pt, °C.: -18
Pour pt, °C.: -21
Vis., cSt @ 40° C.: 2.20
Aniline pt, °C.: 66.8
Diesel index: 60.2
Cetane index: 56.5

Residue
Range, °C.: 350 +
Yield, vol %: 33.7
Gravity, °API: 21.8
Kin. vis., cSt @ 50° C.: 69.1
Pour pt, °C.: +33
Sulfur, wt %: 2.2
Asphaltenes, wt %: 0.2
Con. carbon, wt %: 4.0
V/Ni, mg/kg: 1.0/0.9

Residue
Range, °C.: 550 +
Yield, vol %: 10.10
Gravity, °API: 13.2
Kin. vis., cSt @ 100° C.: 147.6
Pour pt, °C.: +18
Sulfur, wt %: 2.96
Asphaltenes, wt %: 1.0
Con. carbon, wt %: 13.6
V/Ni, mg/kg: 3.0/2.5

North Sea

Argyll, U.K. North Sea

SBM in producing area

Crude
Density @ 15° C.: 0.8349
Sulfur, wt %: 0.18
Pour pt, °C.: +6
Vis., cSt @ 40° C.: 4.79

Naphtha
Range, °C.: lbp-175
Yield, vol %: 25.2
Density @ 15° C.: 0.728
Sulfur, wt %: <0.001

Kerosine
Range, °C.: 175-260
Yield, vol %: 14.9

Density @ 15° C.: 0.804
Sulfur, wt %: 0.03
Copper strip test: 1.A
Smoke pt, mm: 22
Freeze pt, °C.: -37

Gas oil

Range, °C.: 260-360
Yield, vol %: 18.9
Density @ 15° C.: 0.839
Sulfur, wt %: 0.11
Cetane index: 64.5
Cloud pt, °C.: 0
Pour pt, °C.: -3
Cold filter pt, °C.: -2
Vis., cSt @ 40° C.: 4.45

Residue

Range, °C.: 360+
Yield, vol %: 40.6
Density @ 15° C.: 0.9136
Sulfur, wt %: 0.34
V/Ni/Fe, ppm: 3.9/2.1/2.7
Pour pt, °C.: +30
Vis., cSt @ 100° C.: 17.19

Auk, U.K. North Sea

SBM in producing area

Crude

Gravity, °API @ 60° F.: 37.15
Sulfur, wt %: 0.45
Wax, wt %: 6.5
Pour pt (ASTM max.), °C./°F.: +9/+50
Kin. vis., cSt @ 40° C.: 4.38
H₂S existent/potential ppm: <1/<1
Acid value, mg KOH/g (TAN): 0.13
Rvp, lb: 6
C₄—, vol %/wt %: 2.2/1.5

Gasoline

Range, °C.: C₅—85
Yield, vol %/wt %: 8.0/6.5
Sp gr @ 15° C.: 0.685
RON, clear: 66
RON + 0.5 g Pb/l Pb: 82

Naphtha

Range, °C.: 85-165
Yield, vol %/wt %: 15.5/14.0
Sp gr @ 15° C.: 0.755
Sulfur, wt %: 0.002
P/N/A, wt %: 51/34/15

Kerosine

Range, °C.: 165-235
Yield, vol %/wt %: 13.0/12.5
Sp gr @ 15° C.: 0.802
Sulfur, wt %: 0.01
Smoke pt, mm: 25
Aromatics, vol %: 19

Gas oil

Range, °C.: 235-300
Yield, vol %/wt %: 12.5/12.4
Sp gr @ 15° C.: 0.828
Sulfur, wt %: 0.09
Cetane no.: 60
Cloud pt, °C.: -19

Gas oil

Range, °C.: 300-350
Yield, vol %/wt %: 9.4/9.6
Sp gr @ 15° C.: 0.847
Sulfur, wt %: 0.35
Cetane no.: 63
Cloud pt, °C.: +9
Kin. vis., cSt @ 40° C.: 5.53

Residue

Range, °C.: 350+
Yield, vol %/wt %: 39.2/43.5
Sp gr @ 15° C.: 0.932
Sulfur, wt %: 0.93
Wax, wt %: 13
Pour pt, °C.: +45
Kin vis., cSt @ 60° C.: 96.7

@ 100° C.: 20.7
Acid value: 0.15
Asphaltenes, wt %: 4.0
Con. car. residue: 7%
V/Ni, ppm: 14/3

Beatrice, U.K. North Sea

Nigg Bay terminal

Crude

Gravity, °API: 38.7
Sulfur, wt %: 0.05
Pour pt, °F.: 55
Rvp, psi: 5.60
Vis., cSt @ 104° F.: 6.85
@ 122° F.: 5.15
C₁—C₉, yield, vol %: 3.77

Light naphtha

Range, VT °F.: 68-158
Yield, vol %: 3.6
Gravity, °API: 86.5
Rvp, psi: 7.9
RON, clear: 64.6
MON, clear: 63.2
Paraffins, vol %: 93.1
Naphthenes, vol %: 6.2
Aromatics, vol %: 0.7

Naphtha

Range, °F.: 158-212
Yield, vol %: 3.5
Gravity, °API: 67.0
Total sulfur, wt %: 0.0002
P/N/A, vol %: 63.7/32.0/4.3

Heavy naphtha

Range, °F.: 212-302
Yield, vol %: 7.3
Gravity, °API: 59.4
Total sulfur, wt %: 0.0004
P/N/A vol %: 69.2/18.6/12.2

Kerosine

Range, °F.: 302-401
Yield, vol %: 8.8
Gravity, °API: 52.4
Total sulfur, wt %: 0.0024
Smoke point, mm: 37
Freeze pt, °F.: -67
Cloud pt, °F.: -70
Pour pt, °F.: -75
Aniline pt, °F.: 148.4
Diesel index: 78
Aromatics, vol %: 8.5
Vis., cSt @ 100° F.: 1.08
@ 210° F.: 0.59

Middle distillate

Range, °F.: 401-509
Yield, vol %: 10.8
Gravity °API: 44.6
Total sulfur, wt %: 0.0081
Aniline pt, °F.: 163.9
Diesel index: 73
Cetane index: 59
Cloud pt, °F.: -4
Pour pt, °F.: -10
Vis., cSt @ 100° F.: 1.89
@ 212° F.: 0.88

Middle distillate

Range, °F.: 401-650
Yield, vol %: 25.8
Gravity, °API: 41.7
Total sulfur, wt %: 0.0191
Aniline pt, °F.: 176.8
Diesel index: 74
Cetane index: 65
Cloud pt, °F.: 38
Pour pt, °F.: 35
Vis., cSt @ 212° F.: 1.21

Gas oil

Range, °F.: 650-1,049
Yield, vol %: 34.7

Gravity, °API: 31.5
Total sulfur, wt %: 0.061
Aniline pt, °F.: 221.3
Con. carbon, wt %: 0.14
Pour pt, °F.: 105
Vis., cSt @ 212° F.: 5.03
V/Ni/Fe, wt ppm: 0.13/0.03/0.18

Residue

Range, °F.: 1,049+
Yield, vol %: 14.4
Gravity °API: 18.7
Total sulfur, wt %: 0.15
Con. carbon, wt %: 9.3
Vis., cSt @ 212° F.: 150
V/Ni/Fe, wt ppm: 0.95/4.20/16.50

Beryl, U.K. North Sea

SBM in producing area

Crude

Gravity, °API: 36.5
Kin. vis., cSt @ 59° F.: 9.47
Con. carbon residue, wt %: 1.3
Sulfur, wt %: 0.42
Rvp, psi: 5.2
V/Ni, ppm: 3.7/0.8
C₅ & lighter, vol %: 4.27

Naphtha

Range (TBP), °F.: 60-120
Yield, vol %: 2.29
Rvp, psi: 17.5
Paraffins, vol %: 97.5
Naphthenes, vol %: 2.5
Aromatics, vol %: 0.0
RON, clear: 80.5

Naphtha

Range, °F.: 120-330
Yield, vol %: 21.89
Sp gr, 60°/60° F.: 0.7519
Rvp, psi: 2.5
P/N/A, vol %: 48.7/33.8/17.6
RON, clear: 61.4
RON + 3 ml TEL: 81.6
Sulfur, wt %: 0.0014
Nitrogen, ppm: 2.2

Kerosine

Range, °F.: 330-425
Yield, vol %: 10.70
Sp gr: 0.7976
P/N/A, vol %: 42.5/36.4/21.1
Sulfur, wt %: 0.0168

Light gas oil

Range, °F.: 425-650
Yield, vol %: 24.75
Sp gr: 0.8441
Gravity, °API: 36.1
Pour pt, °F.: 5
Aniline pt, °F.: 155.5
Diesel index: 56
Cetane index: 51
Sulfur, wt %: 0.21

Heavy gas oil

Range, °F.: 650-995
Yield, vol %: 25.89
Gravity, °API: 26.1
Sp gr: 0.8981
Pour pt, °F.: 95
Kin. vis., cSt @ 100° F.: 38.30
Aniline pt, °F.: 190.8
Total nitrogen, ppm: 1.317

Residue

Range, °F.: 995+
Yield, vol %: 12.95
Gravity, °API: 14.4
Sp gr, 60°/60° F.: 0.9698
Pour pt, °F.: 120
Kin. vis., cSt @ 100° F.: 14,827.95
Sulfur, wt %: 1.04
Con. carbon, wt %: 8.80
V/Ni, ppm: 24.0/5.7

Residue

Range, °F.: 650+
Yield, vol %: 38.85
Gravity, °API: 22.0
Sp gr: 0.9220
Pour pt, °F.: 100
Kin. vis., cSt @ 100° F.: 190.47
Sulfur, wt %: 0.78
Total nitrogen, ppm: 2.258
Con. carbon, wt %: 3.14
V/Ni, ppm: 8.4/2.0

Brae, U.K. North Sea**Scheduled to join Forties system in mid 1983****Crude**

Gravity, °API: 33.6
Sulfur, wt %: 0.73
Vis., cSt @ 10° C.: 13.6
Pour pt., °C.: -6
Carbon residue, wt %: 2.3
Asphaltenes, wt %: 0.35
V/Ni, ppm wt: 2.5/0.4
C₁-C₄, wt %: 2.15

Gasoline

Range (TBP), °C.: C₅-95
Yield, vol %: 9.25
Density @ 15° C., kg/l: 0.6985

Naphtha

Range, °C.: C₅-149
Yield, vol %: 21.45
Density @ 15° C., kg/l: 0.7405
Sulfur, wt %: 0.0005
P/N/A, wt %: 51.4/30.9/25.6

Kerosine

Range, °C.: 149-232
Yield, vol %: 15.2
Density @ 15° C., kg/l: 0.8125
Sulfur, wt %: 0.034
Aromatics, vol %: 25.7
Smoke pt, mm: 21
Cold test, °C.: -62
Aniline pt, °C.: 45.5
Diesel index: 49
Cetane index: 40

Gas oil

Range, °C.: 232-342
Yield, vol %: 21.3
Density @ 15° C., kg/l: 0.864
Sulfur, wt %: 0.55
Cloud pt, °C.: -15
Pour pt, °C.: -18
Acidity, mg KOH/g: 0.02
Aniline pt, °C.: 60.6
Diesel index: 45
Cetane index: 47

Residue

Range, °C.: 342+
Yield, vol %: 39.3
Density @ 15° C., kg/l: 0.9435
Sulfur, wt %: 1.41
Vis., cSt @ 50° C.: 128
Pour pt, °C.: 36
Carbon residue, wt %: 5.5
Asphaltenes, wt %: 0.75
V/Ni, ppm wt: 6.5/0.9

F.C.C. feed

Range, °C.: 369-509
Yield, vol %: 20.55
Density @ 15° C., kg/l: 0.921
Vis., cSt @ 100° C.: 7.22
Wax, wt %: 14
Aniline pt, °C.: 79.2

Note: Assay run on preproduction crude sample.

Brent, U.K. North Sea**Brent system to Sullom Voe and SPAR in producing area****Crude**

Gravity, °API @ 60° F.: 38.16
Sulfur, wt %: 0.26
Wax, wt %: 6.5
Pour pt (ASTM max.), °C.: -3
Kin vis., @ 40° C., cSt: 3.72
H₂S existent/potential, ppm: <1 <1
Acid value, mg KOH/g (TAN): 0.05
Rvp, lb: 8.5
C₄-, vol %: 3.2

Gasoline

Range, °C.: C₅-85
Yield, vol %: 7.5
Sp gr @ 15° C.: 0.692
RON, clear: 71
RON + 0.5 g Pb/l Pb: 85

Naphtha

Range, °C.: 85-165
Yield, vol %: 17.7
Sp gr @ 15° C.: 0.769
Sulfur, wt %: 0.003
P/N/A, wt %: 42/34/24

Kerosine

Range, °C.: 165-235
Yield, vol %: 13.5
Sp gr @ 15° C.: 0.806
Sulfur, wt %: 0.01
Smoke pt, mm: 23
Aromatics, vol %: 21

Gas oil

Range, °C.: 235-300
Yield, vol %: 12.9
Sp gr @ 15° C.: 0.840
Sulfur, wt %: 0.05
Cetane index: 52
Cloud pt, °C.: -19

Gas oil

Range, °C.: 300-350
Yield, vol %: 9.2
Sp gr @ 15° C.: 0.860
Sulfur, wt %: 0.25
Cetane index: 57.5
Cloud pt, °C.: +6
Kin. vis., cSt @ 40° C.: 6.36

Residue

Range, °C.: 350+
Yield, vol %: 36.5
Sp gr @ 15° C.: 0.913
Sulfur, wt %: 0.55
Wax, wt %: 13
Pour pt, °C.: +36
Kin. vis., cSt @ 40° C.: 51.8
@ 100° C.: 13.5
Acid value: 0.08
Asphaltenes, wt %: 0.05
V/Ni, ppm: 4/1.5

Note: This is assay of unblended Brent crude loaded at offshore SPAR.

Brent Blend, U.K. North Sea**Sullom Voe Terminal, Shetlands****Crude**

Gravity, °API: 38.0
Vis., cSt @ 20° C.: 5.67
@ 37.8° C.: 3.64

Pour pt, °C.: -15
Rvp, psig: 12.8
Sulfur, wt %: 0.38
Wax, wt %: 5.2
Asphaltenes, wt %: 0.26
V/Ni/Fe, ppm: 3.8/0.80/0.10

Light naphtha

Range, °C.: C₅-75
Yield, vol %: 6.2
Gravity, °API: 78.3
RON, clear: 72.0
Paraffins, wt %: 79.2
Olefins, wt %: Nil
Naphthenes, wt %: 16.8
Aromatics, wt %: 4.0

Naphtha

Range, °C.: C₅-165
Yield, vol %: 24.5
Gravity, °API: 60.1
Sulfur, ppm: 15
P/O/N/A, wt %: 59.0/Nil/33.0/8.0

Kerosine

Range, °C.: 165-235
Yield, vol %: 12.6
Gravity, °API: 45.0
Sulfur, wt %: 0.043
Smoke pt, mm: 26
Freeze pt, °C.: -56
Aromatics, vol %: 17.9

Gas oil

Range, °C.: 165-350
Yield, vol %: 33.3
Gravity, °API: 39.1
Sulfur, wt %: 0.14
Cetane index: 53.0
Pour pt, °C.: -21
Vis., cSt @ 37.8° C.: 2.37
@ 50° C.: 1.92
Aniline pt, °C.: 66.8

Gas oil

Range, °C.: 235-350
Yield, vol %: 20.7
Gravity, °API: 35.7
Sulfur, wt %: 0.19
Cetane index: 54.0
Pour pt, °C.: -12
Vis., cSt @ 37.8° C.: 3.79
@ 50° C.: 2.94
Aniline pt, °C.: 71.4

Vacuum gas oil

Range, °C.: 350-550
Yield, vol %: 28.3
Gravity, °API: 26.1
Sulfur, wt %: 0.57
Vis., cSt @ 100° F.: too waxy
Pour pt, °C.: +39
Con. carbon, wt %: 0.29
V/Ni/Fe, ppm: 0.05/0.02/0.14
UOP K factor: 12.3

Residue

Range, °C.: 590+
Yield, vol %: 10.3
Gravity, °API: 11.5
Sulfur, wt %: 1.35
Vis., cSt @ 37.8° C.: too waxy
Wax content, wt %: 10.4
Pour pt, °C.: +42
Con. carbon, wt %: 15.7
V/Ni/Fe, ppm: 25/5.7/0.96

Note: Analysis run on sample from tanker at Sullom Voe mid October 1981. Contributors to Brent Blend in early 1983 were North and South Cormorant, Brent, Dunlin, Thistle, and Murchison.

Buchan, U.K. North Sea**CALM in producing area**

Crude

Gravity, °API: 33.7
Sulfur, wt %: 0.84
Vis., cSt @ 20° C.: 20.37
Pour pt, °C.: 6
Carbon residue, wt %: 5.0
Total C₁—C₄, yield, wt %: 1.50
V/Ni, ppm wt %: 19/4

Gasoline

Range (TBP), °C.: C₅—95
Yield, vol %: 9.45
Paraffins, wt %: 71.2
Naphthenes, wt %: 24.5
Aromatics, wt %: 4.3

Naphtha

Range, °C.: C₅—149
Yield, vol %: 19.9
Sulfur, wt %: 0.0009
P/N A, wt %: 58.1/31.9/10.0

Kerosine

Range, °C.: 149-232
Yield, vol %: 14.45
Density @ 15° C., kg/l: 0.7965
Sulfur, wt %: 0.037
Aromatics, vol %: 18.8
Smoke pt, mm: 24
Aniline pt, °C.: 54.9
Diesel index: 60
Cetane index: 45

Gas oil

Range, °C.: 232-342
Yield, vol %: 20.55
Density @ 15° C., kg/l: 0.8465
Sulfur, wt %: 0.43
Vis., cSt @ 50° C.: 2.72
Pour pt, °C.: -15
Aniline pt, °C.: 68.0
Diesel index: 55
Cetane index: 54

Gas oil

Range, °C.: 342-369
Yield, vol %: 4.2
Sulfur, wt %: 0.93
Pour pt, °C.: 15
Aniline pt, °C.: 74.9
Diesel index: 50
Cetane index: 57

Gas oil

Range, °C.: 369-509
Yield, vol %: 20.15
Density @ 15° C., kg/l: 0.9055
Sulfur, wt %: 1.06
Vis., cSt @ 60° C.: 21.1
@ 100° C.: 6.76
Wax, wt %: 12.5
Aniline pt, °C.: 84.6

Residue

Range, °C.: 342 +
Yield, vol %: 43.25
Density @ 15° C., kg/l: 0.950
Sulfur, wt %: 1.56
Vis., cSt @ 50° C.: 304
Pour pt, °C.: 36
Carbon residue, wt %: 10.5
V/Ni, wt ppm: 39/8
V/Ni, wt ppm: (509 + °C.): 84/18
Sulfur, wt % (509 + °C.): 2.17

Cormorant, North, U.K. North Sea

Brent system to Sullom Voe

Crude

Gravity, °API: 34.9
Density @ 15° C., kg/l: 0.850
Sulfur, wt %: 0.71
Pour pt, °C.: +12

Kin. vis., @ 40° C., sq mm/sec: 5.76
Acid value, mg KOH/g (TAN): <0.05
C₄—, vol %: 2.6

Gasoline

Range, °C.: C₅—85
Yield, vol %: 7.0
Density @ 15° C.: 0.677
RON, clear: 69
RON + 0.5 g Pb/l: 84

Naphtha

Range, °C.: 85-165
Yield, vol %: 14.5
Density @ 15° C.: 0.759
Paraffins, wt %: 49
Naphthenes, wt %: 39
Aromatics, wt %: 20

Kerosine

Range, °C.: 165-235
Yield, vol %: 11.7
Density @ 15° C.: 0.804
Sulfur, wt %: 0.04
Smoke pt, mm: 24
Aromatics, vol %: 20

Gas oil

Range, °C.: 235-300
Yield, vol %: 12.5
Density @ 15° C.: 0.837
Sulfur, wt %: 0.24
Cetane index: 53
Cloud pt, °C.: -23

Gas oil

Range, °C.: 300-350
Yield, vol %: 9.4
Density @ 15° C.: 0.860
Sulfur, wt %: 0.56
Cetane index: 58
Cloud pt, °C.: +8
Kin. vis., @ 40° C., sq mm/sec: 5.92

Residue

Range, °C.: 350 +
Yield, vol %: 42.7
Density @ 15° C.: 0.916
Sulfur, wt %: 0.56
Wax, wt %: 12
Pour pt, °C.: +36
Kin. vis., @ 60° C., sq mm/sec: 101
@ 100° C.: 20.0
Acid value: 0.05
Asphaltenes, wt %: 0.66
Con. carbon, wt %: 5.4
V/Ni, ppm: 23/11

Note: This was designated a provisional assay in early 1983.

Cormorant, South (Cormorant "A"), U.K. North Sea

Brent system to Sullom Voe

Crude

Gravity, °API: 35.7
Density @ 15° C. (kg/l): 0.846
Sulfur, wt %: 0.56
Pour pt, °C.: -6
Kin. vis., @ 40° C., sq mm/sec: 5.0
Acid value, mg KOH/g (TAN): 0.05
C₄—, vol %: 2.8

Gasoline

Range, °C.: C₅—85
Yield, vol %: 7.5
Density @ 15° C.: 0.679
RON, clear: 71
RON + 0.5 g Pb/l: 85

Naphtha

Range, °C.: 85-165
Yield, vol %: 15.4
Density @ 15° C.: 0.764
Sulfur, wt %: 0.001

Paraffins, wt %: 44
Naphthenes, wt %: 39
Aromatics, wt %: 17

Kerosine

Range, °C.: 165-235
Yield, vol %: 12.9
Density @ 15° C.: 0.806
Sulfur, wt %: 0.03
Smoke pt, mm: 21
Aromatics, vol %: 21

Gas oil

Range, °C.: 235-300
Yield, vol %: 13.4
Density @ 15° C.: 0.840
Sulfur, wt %: 0.16
Cetane index: 51.5
Cloud pt, °C.: -18

Gas oil

Range, °C.: 300-350
Yield, vol %: 7.9
Density @ 15° C.: 0.863
Sulfur, wt %: 0.49
Cetane index: 52
Cloud pt, °C.: +5
Kin. vis., @ 40° C., sq mm/sec: 6.27

Residue

Range, °C.: 350 +
Yield, vol %: 40.5
Density @ 15° C.: 0.931
Sulfur, wt %: 1.06
Wax, wt %: 10
Pour pt, °C.: 36
Kin. vis., @ 60° C., sq mm/sec: 81.1
@ 100° C.: 16.1
Acid value: 0.1
Asphaltenes, wt %: 0.55
V/Ni, ppm: 3/21

Dan, Denmark North Sea

Contributor to Gorm Blend

Crude

Gravity, °API: 30.4
Sulfur, wt %: 0.34
Vis., cSt @ 40° C.: 8.90
Pour pt, °F.: <-45
C₄ & lighter, vol %: 0.8

Light gasoline

Range, °F.: C₅—200
Yield, vol %: 5.8%
Density, kg/l: 0.714
Sulfur, wt %: 0.002
RON, clear: 80.0

Naphtha

Range, °F.: 200-405
Yield, vol %: 20.3
Density, kg/l: 0.791
Sulfur, wt %: 0.05
RON, clear: 63.7

Light gas oil

Range, °F.: 405-650
Yield, vol %: 26.6
Density, kg/l: 0.868
Sulfur, wt %: 0.19
Pour pt, °F.: -45

Heavy gas oil

Range, °F.: 650-1,000
Yield, vol %: 30.0
Density, kg/l: 0.920
Sulfur, wt %: 0.42
Pour pt, °F.: 60
Vis., cSt @ 50° C.: 44.2

Atmospheric resid

Range, °F.: 650 +
Yield, vol %: 46.5

Density, kg/l: 0.942
Sulfur, wt %: 0.55
Pour pt, °F.: 45
Vis., cSt @ 50° C.: 269
Carbon residue, wt %: 5.0

Vacuum residue
Range, °F.: 1,000 +
Yield, vol %: 16.5
Density, kg/l: 0.977
Sulfur, wt %: 0.70
Pour pt, °F.: 100
Vis., cSt @ 100° C.: 326

Dunlin, U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API @ 60° F.: 34.9
Sulfur, wt %: 0.39
Wax, wt %: 5.0
Pour pt (ASTM max.), °C.: +6
Kin. vis., cSt @ 40° C.: 4.92
C₄—, vol %: 2.3

Gasoline
Range, °C.: C₅—85
Yield, vol %: 6.8
Sp gr @ 15° C.: 0.682
RON, clear: 69

Naphtha
Range, °C.: 85–165
Yield, vol %: 15.2
Sp gr @ 15° C.: 0.761
P/N/A, wt %: 42/43/15

Kerosine
Range, °C.: 165–235
Yield, vol %: 11.8
Sp gr @ 15° C.: 0.809
Sulfur, wt %: 0.025
Smoke pt, mm: 22
Aromatics, vol %: 21

Gas oil
Range, °C.: 235–300
Yield, vol %: 13.0
Sp gr @ 15° C.: 0.846
Sulfur, wt %: 0.13
Cetane index: 50
Cloud pt, °C.: —25

Gas oil
Range, °C.: 300–350
Yield, vol %: 10.0
Sp gr @ 15° C.: 0.864
Sulfur, wt %: 0.32
Cetane index: 56
Cloud pt, °C.: —1
Kin. vis., cSt @ 40° C.: 6.3

Residue
Range, °C.: 350 +
Yield, vol %: 41.2
Sp gr @ 15° C.: 0.930
Sulfur, wt %: 0.74
Wax, wt %: 10
Pour pt, °C.: +33
Vis., kin., cSt @ 60° C.: 82.4
@ 100° C.: 18.3
Acid value: 0.2
Asphaltenes, wt %: 0.24
V/Ni, ppm wt %: 5/2

Ekofisk, Norway North Sea

Seal Sands, Teesside, U.K. terminal

Crude
Gravity, °API: 43.4

Sulfur, wt %: 0.14
Pour pt, °F.: 10
Vis., SUS @ 70° F.: 36.1
Rvp, psig: 5.0
Yield, C₁—C₅, wt %: 6.43

Gasoline
Range, °F.: lbp—176
Yield, vol %: 11.9
RON, clear: 66

Naphtha
Range, °F.: 176–302
Yield, vol %: 20.2
Gravity, °API: 57.9
Paraffins, vol %: 53.1
Naphthenes, vol %: 36.8
Aromatics, vol %: 10.1
Sulfur, ppm: 3

Kerosine
Range, °F.: 302–400
Yield, vol %: 10.6
Gravity, °API: 48.7
Total sulfur, wt %: 0.002
Aniline pt, °F.: 137
Smoke pt, °F.: 23
Freezing pt, °F.: —85

Gas oil
Range, °F.: 400–662
Yield, vol %: 23.4
Gravity, °API: 38.0
Vis., cSt @ 100° F.: 3.01
Pour pt, °F.: 0
Aromatics, vol %: 17
Total sulfur, wt %: 0.07
Aniline pt, °F.: 162
Diesel index: 62

Gas oil
Range, °F.: 302–707
Yield, vol %: 37.3
Gravity, °API: 40.2
Pour pt, °F.: 5

Heavy gas oil
Range, °F.: 707–977
Yield, vol %: 13.2
Gravity, °API: 25.0
Vis., cSt @ 122° F.: 34.05
Pour pt, °F.: 97
Total sulfur, wt %: 0.25
Con. carbon, wt %: 0.047
Aniline, °F.: 200.5
V/Ni/Fe, ppm: 0.8/0.3/0.3

Residue
Range, °F.: 707 +
Yield, vol %: 25.2
Gravity, °API: 20.9
Vis., SUS @ 212° F.: 117.2
Pour pt, °F.: 97
Sulfur, wt %: 0.40
Con. carbon, wt %: 4.3
V/Ni/Fe, ppm: 0.4/5.7/1.2

Note: Seven fields contribute to the Ekofisk Blend, which this assay represents. They are Ekofisk, West Ekofisk, Cod (pure gas condensate), Tor, Eldfisk, Edda, and Albuskjell. Condensate is not included in gasoline and naphtha blends listed.

Flotta, U.K. North Sea

Flotta terminal, Orkney Islands

Crude
Gravity, °API: 35.7
Sulfur, wt %: 1.14
Vis., cSt @ 40° F.: 30.8
@ 104° F.: 4.38
Pour pt, °F.: 21.0
C₄ & lighter, vol %: 4.3
Rvp @ 100° F., psi: 9.1

Naphtha
Range, °F.: C₅—149
Yield, vol %: 5.0
Sulfur, wt %: 0.001
Paraffins, vol %: 94.5
Naphthenes, vol %: 3.5
Aromatics, vol %: 1.5
RON, clear: 73.0
RON + 0.4 g Pb/l: 86.0
Rvp @ 100° F., psi: 18.2

Naphtha
Range, °F.: 149–302
Yield, vol %: 14.9
Gravity, °API: 59.9
Sulfur, wt %: 0.001
P/N/A, vol %: 66/0/27.5/16.0
RON, clear: 58.0

Naphtha
Range, °F.: 302–356
Yield, vol %: 5.6
Gravity, °API: 50.0
Sulfur, wt %: 0.04
Rvp @ 100° F., psi: 0.6
P/N/A, vol %: 49.5/30.5/19.5
Smoke pt, mm: 23
Freeze pt, °F.: —76

Kerosine
Range, °F.: 356–455
Yield, vol %: 8.0
Gravity, °API: 44.1
Sulfur, wt %: 0.11
Vis., cSt @ 104° F.: 1.23
Aromatics, vol %: 23.0
Smoke pt, mm: 20.5
Freeze pt, °F.: —48
Aniline pt, °F.: 129
Cloud pt, °F.: —66

Gas oil
Range, °F.: 455–572
Yield, vol %: 11.8
Gravity, °API: 37.0
Sulfur, wt %: 0.51
Vis., cSt @ 104° F.: 2.3
Aromatics, vol %: 28.0
Aniline pt, °F.: 141
Cloud pt, °F.: —10

Gas oil
Range, °F.: 572–650
Yield, vol %: 8.4
Gravity, °API: 32.5
Sulfur, wt %: 1.05
Vis., cSt @ 104° F.: 4.78
Aromatics, vol %: 36.0
Aniline pt, °F.: 157
Cloud pt, °F.: 29

Gas oil
Range, °F.: 650–1,000
Yield, vol %: 28.5
Gravity, °API: 23.2
Sulfur, wt %: 1.69
Vis., cSt @ 122° F.: 25.8
Pour pt, °F.: 91
Aniline, pt °F.: 171
Con. carbon residue, wt %: 0.29
V/Ni/Fe, ppm: <1/1/2

Residue
Range, °F.: 650 +
Yield, vol %: 42.0
Gravity, °API: 18.3
Sulfur wt %: 2.08
Vis., cSt @ 104° F.: 220
@ 122° F.: 127
Pour pt, °F.: 86
Aniline pt °F.: 173
Con. carbon, wt %: 5.9
V/Ni/Fe: <3/7/3

Note: Flotta is a blend made up of Piper, Claymore, and Tartan crudes. Tartan appears in this section while Piper and Flotta (before introduction of Tartan) are in OGJ, Dec. 3, 1979, p. 102.

Forties, U.K. North Sea Fulmar, U.K. North Sea

Hound Point terminal, Firth of Forth

Crude

Gravity, °API: 36.6
Sulfur, wt %: 0.30
Vis., cSt @ 10° C.: 9.6
@ 21.1° C.: 6.81
Pour pt., °C.: -3
Wax, wt %: 7.0
Carbon residue, wt %: 2.2
Asphaltenes, wt %: 0.2
V/Ni, ppm wt: 3/2
Watson K factor: 11.9
C₁-C₄, wt %: 2.74

Gasoline

Range (TBP), °C.: C₅-95
Yield, vol %: 9.23
Sulfur, wt %: <0.001
RON, clear: 69.5
RON + 0.44 ml TEL/l: 83
P/N/A, wt %: 71.1/25.7/3.2

Naphtha

Range, °C.: C₅-149
Yield, vol %: 20.02
Density @ 15° C., kg/l: 0.723
Sulfur, wt %: <0.001
RON, clear: 62
RON + 0.44 ml TEL/l: 77.5
P/N/A, wt %: 54.9/35.8/9.3

Kerosine

Range, °C.: 149-232
Yield, vol %: 14.50
Density @ 15° C., kg/l: 0.7995
Sulfur, wt %: 0.010
Aromatics, vol %: 19.5
Smoke pt., mm: 24
Cold test, °C.: -58
Aniline pt., °C.: 54
Diesel index: 59
Cetane index: 44

Gas oil

Range, °C.: 232-342
Yield, vol %: 20.92
Density @ 15° C., kg/l: 0.852
Sulfur, wt %: 0.14
Vis., cSt @ 37.8° C.: 3.5
@ 50° C.: 2.7
Cloud pt., °C.: -15
Pour pt., °C.: -15
Aniline pt., °C.: 67
Diesel index: 53
Cetane index: 52

Residue

Range, °C.: 342+
Yield, vol %: 40.96
Density @ 15° C., kg/l: 0.9265
Sulfur, wt %: 0.61
@ 50° C.: 102
Pour pt., °C.: 33
Wax, wt %: 14.3
Carbon residue, wt %: 4.8
Asphaltenes, wt %: 0.5
V/Ni, ppm wt: 7/4

FCC feed

Range, °C.: 369-509
Yield, vol %: 20.38
Density @ 15° C., kg/l: 0.9045
Sulfur, wt %: 0.44
Vis., cSt @ 37.8° C.: 45.6
Total nitrogen, ppm wt: 960
Aniline pt., °C.: 88

Note: Assay based on analyses of production crude samples obtained at rates of up to 400,000 b/d.

SBM in producing area

Crude

Gravity, °API: 39.3
Density @ 15° C., kg/l: 0.828
Sulfur, wt %: 0.26
Pour pt., °C.: -12
Kin. vis., @ 40° C., sq mm/sec: 2.55
Acid value, mg KOH/g (TAN): 0.06
Yield C₂-... vol %: 2.7

Gasoline

Range, °C.: C₅-85
Yield, vol %: 19.5
Density @ 15° C.: 0.666
RON, clear: 71
RON + 0.5 g Pbl: 85

Naphtha

Range, °C.: 85-165
Yield, vol %: 19.5
Density @ 15° C.: 0.757
Sulfur, wt %: 0.001
Paraffins, wt %: 55
Naphthenes, wt %: 26
Aromatics: 19

Kerosine

Range, °C.: 165-235
Yield, vol %: 15.7
Density @ 15° C.: 0.804
Sulfur, wt %: 0.02
Smoke pt.: 23
Aromatics, vol %: 23

Gas oil

Range, °C.: 235-300
Yield, vol %: 12.2
Density @ 15° C.: 0.839
Sulfur, wt %: 0.06
Cetane index: 51.5

Gas oil

Range, °C.: 300-350
Yield, vol %: 9.5
Density @ 15° C.: 0.856
Sulfur, wt %: 0.26
Cetane index: 60
Cloud pt., °C.: +3
Kin. vis., @ 40° C., sq mm/sec: 5.70

Residue

Range, °C.: 350+
Yield, vol %: 33.1
Density @ 15° C.: 0.916
Sulfur, wt %: 0.56
Pour pt., °C.: +33
Kin. vis., @ 60° C.: sq mm/sec: 44.1
@ 100° C.: 11.3
Acid value: 0.08
Asphaltenes, wt %: 1.8
V/Ni, ppm: 5/1

Note: This has been designated a tentative assay

Gorm, Denmark North Sea

SBM in producing area

Crude

Gravity, °API: 33.9
Sulfur, wt %: 0.23
Vis., cSt @ 40° C.: 5.44
Pour pt., °F.: -35
C₂ & lighter, vol %: 1.6

Light gasoline

Range, °F.: C₅-300
Yield, vol %: 19.7
Density, kg/l: 0.729
Sulfur, wt %: 0.001
P/N/A vol %: 53/40/7

Naphtha

Range, °F.: 300-400
Yield, vol %: 10.0
Density, kg/l: 0.800
Sulfur, wt %: 0.026
Smoke pt., mm: 23
Freezing pt., °F.: <-74
Aniline pt., °F.: 120
P/N/A vol %: 32/47/21

Kerosine

Range, °F.: 400-500
Yield, vol %: 12.1
Density, kg/l: 0.841
Sulfur, wt %: 0.065
Smoke pt., mm: 16
Freezing pt., °F.: -47
Cloud pt., °F.: -50
Pour pt., °F.: -60
Aniline pt., °F.: 134

Diesel oil

Range, °F.: 500-650
Yield, vol %: 15.9
Density, kg/l: 0.865
Sulfur, wt %: 0.16
Cloud pt., °F.: 16
Pour pt., °F.: 20
Aniline pt., °F.: 155

Gas oil

Range, °F.: 650-815
Yield, vol %: 15.0
Density, kg/l: 0.903
Sulfur, wt %: 0.30
Nitrogen, wt %: 0.08
Pour pt., °F.: 70
Aniline pt., °F.: 176
Vis., cSt @ 50° C.: 19.9

Heavy gas oil

Range, °F.: 815-1,000
Yield, vol %: 10.8
Density, kg/l: 0.924
Sulfur, wt %: 0.37
Nitrogen, wt %: 0.18
Pour pt., °F.: 100
Aniline pt., °F.: 196
Vis. cSt @ 50° C.: 110

Residuum

Range, °F.: 1,000+
Yield, vol %: 14.9
Density, kg/l: 0.972
Sulfur, wt %: 0.59
Nitrogen, wt %: 0.60
Hydrogen, wt %: 11.2
Carbon residue, wt %: 9.6
Vis., cSt @ 100° C.: 300
V/Ni, ppm: 65/40

Note: Subsequent to this assay Gorm has been joined by crude from Dan field (13% of blend in late 1982) and Skjold field (6% of blend). Skjold is marginal field. Dan has gravity of 30.4° API & sulfur content of 0.34 wt %

Gullfaks, Norway North Sea

Block 34/10—Not yet in production

Crude

Gravity, °API: 28.6
Sp gr. 60/60: 0.8838
Sulfur, wt %: 0.44
Pour pt., °F.: -50
Vis., cSt @ 100° F.: 10.14

Gasoline

Range, °C.: 20-70
Yield, wt %: 0.8
Sp gr. 60/60: 0.6948
Sulfur, wt ppm: 100
RON, clear: 82.9

Paraffins, wt %: 66
Naphthenes, wt %: 32.1
Aromatics, wt %: 1.9

Gasoline
Range, °C: 70-100
Yield, wt %: 2.6
Sp gr, 60/60: 0.7433
Sulfur, wt ppm: 500
P/N/A, wt %: 34.8/58.3/6.9

Gasoline
Range, °C: 100-150
Yield, wt %: 7.0
Sp gr, 60/60: 0.7808
Sulfur, wt %: 0.0023
P/N/A, wt %: 33.44/6.22/4
Yield, wt %: 7.0

Gasoline
Range, °C: 150-190
Yield, wt %: 6.6
Sp gr, 60/60: 0.8056
Sulfur, wt %: 0.0116
P/N/A, wt %: 42.5/32.3/25.2

Kerosine
Range, °C: 150-205
Yield, wt %: 9.2
Sp gr, 60/60: 0.8108
Sulfur, wt %: 0.0148
Smoke pt, mm: 20
Diesel index: 48
Vis., cSt @ 100° F: 1.03

Gas oil
Range, °C: 205-343
Yield, wt %: 28.4
Sp gr, 60/60: 0.8676
Sulfur, wt %: 0.1935
Diesel index: 43
Vis., cSt @ 100° F: 3.61

Residue
Range, °C: 343 +
Yield, wt %: 51.8
Gravity, °API: 19.3
Sp gr, 60/60: 0.9382
Sulfur, wt %: 0.77
Con. carbon, wt %: 3.8
Vis., cSt @ 100° F: 351
Pour pt, °F: 15

Note: This is a preliminary assay.

Magnus, U.K. North Sea

*Ninian system to Sullom Voe
(hookup slated mid 1983)*

Crude
Gravity, °API: 39.3
Sulfur, wt %: 0.28
Pour pt, °C: -3
Vis., cSt @ 21.1 °C: 4.56
Carbon residue, wt %: 1.6
V/Ni, ppm wt %: 4/2
Total C₁-C₄, wt %: 3.15

Gasoline
Range (TBP), °C: C₅-95
Yield, wt %: 9.8

Naphtha
Range, °C: 95-175
Yield, wt %: 16.75
P/N/A, wt %: 39.2/41.3/19.5

Naphtha
Range, °C: C₅-149
Yield, wt %/vol %: 21.45/24.25
Density @ 15° C, kg/l: 0.733
Sulfur, wt %: 0.0015
P/N/A, wt %: 52.9/33.8/13.3

Kerosine
Range, °C: 149-232
Yield, wt %/vol %: 15.0/15.5
Density @ 15° C, kg/l: 0.8015
Sulfur, wt %: 0.0085
Acidity, mg KOH/g: 0.03
Aromatics, vol %: 19.9
Cold test, °C: -53.5
Aniline pt, °C: 54.2
Cetane index: 44

Gas oil
Range, °C: 232-342
Yield, wt %/vol %: 21.4/20.9
Density @ 15° C, kg/l: 0.8485
Sulfur, wt %: 0.15
Pour pt, °C: -15
Acidity, mg KOH/g: 0.05
Aniline pt, °C: 68.0
Diesel index: 54
Cetane index: 53

Gas oil
Range, °C: 342-369
Yield, wt %/vol %: 4.4/4.15
Density @ 15° C, kg/l: 0.8755
Sulfur, wt %: 0.39
Vis., cSt @ 50° C: 6.85
Pour pt, °C: 12
Aniline pt, °C: 77.1
Diesel index: 51
Cetane index: 58

Gas oil
Range, °C: 369-509
Yield, wt %/vol %: 21.15/19.45
Density @ 15° C, kg/l: 0.8995
Sulfur, wt %: 0.43
Vis., cSt @ 98.9° C: 6.27
Wax, wt %: 17.5
Aniline pt, °C: 89.1

Residue
Range, °C: 342 +
Yield, wt %/vol %: 39.0/35.15
Density @ 15° C, kg/l: 0.918
Sulfur, wt %: 0.57
Vis., cSt @ 50° C: 6.9
Carbon residue, wt %: 4.5
Asphaltenes, wt %: 0.35
V/Ni, ppm wt %: 11.4

Residue
Range, °C: 509 +
Yield, wt %/vol %: 13.45/11.55
Density @ 15° C, kg/l: 0.965
Sulfur, wt %: 0.80
Vis., cSt @ 98.9° C: 122
Carbon residue, wt %: 12.0
V/Ni, ppm wt %: 30.7

Note: Preliminary guide to Magnus, which was not in production when assay sample obtained.

Maureen, U.K. North Sea

*Not yet in production. Pro-
duction expected late 1983
or early 1984.*

Crude
Gravity, °API @ 60° F: 35.8/35.3*
Sulfur, wt %: 0.55
Pour test, °F: +45
Vis., SUS @ 70° F: 78.92-81.79*
C₄ -, vol %: 2.6

Gasoline
Range, °F: 60-200
Yield, vol %: 9.0
Sulfur, wt %: 0.002
RON, clear: 72.5
RON + 3 ml TEL/gal: 91.3

Naphtha
Range, °F: 60-400
Yield, vol %: 27.9
P/N/A, vol %: 57.32/31.96/10.72
Sulfur, wt %: 0.002
RON, clear: 52.8
RON + 3 ml TEL/gal: 77.8

Kerosine
Range, °F: 400-500
Yield, vol %: 12.3
Gravity, °API: 39.7
Vis., SUS @ 100° F: 32.15
Freeze pt, °F: -42
P/N/A, vol %: 37.8/40.1/22.1
Sulfur, wt %: 0.05
Aniline pt, °F: 141.0
Smoke pt, mm: 20

Gas oil
Range, °F: 500-650
Yield, vol %: 15.6
Gravity, °API: 34.0
Vis., SUS @ 100° F: 42.34
Pour pt, °F: +20
P/N/A, vol %: 34.3/39.8/25.9
Sulfur, wt %: 0.17
Aniline pt, °F: 163.3
Cetane index: 55.5

Topped crude
Range, °F: 650 +
Yield, vol %: 41.6
Gravity, °API: 19.8
Vis., SUS @ 210° F: 101.05
Pour pt, °F: +90
Sulfur, wt %: 0.64
Rams. car. residue, wt %: 5.07
V/Ni, ppm: 9.5/4.5

Note: The inspection of fractions is based on composite of three drillstem test samples.
* Results from two samples.

Montrose, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 40.1
Sulfur, wt %: 0.23
Rvp, psi: 4.0
Pour pt, °F: 15
Neut. no., mg KOH/g: 0.28
Rams. carbon, wt %: 1.3
Vis kin., cSt @ 68° F: 4.96
@ 100° F: 3.27
V/Ni, ppm: 2/2
C₄ -, vol %: 2.2

Gasoline
Range (TBP), °F: C₅-200
Yield, vol %: 12.3
Sulfur, wt %: 0.002
P/N/A, vol %: 70.0/27.1/2.9
RON, clear: 71.4
RON + 3 cc TEL/gal: 89.5

Naphtha
Range, °F: 200-320
Yield, vol %: 15.0
Gravity, °API: 55.5
Sulfur, wt %: 0.001
Charac. factor: 11.84
P/N/A vol %: 56.2/33.5/10.3
RON, clear: 42.8
RON + 3 cc TEL/gal: 68.0

Kerosine
Range, °F: 320-400
Yield, vol %: 8.9
Gravity, °API: 47.7
Sulfur, wt %: 0.005
Aniline pt, °F: 137.7
Diesel index: 65.7

Cetane index: 45.1
Freeze pt, °F: -75
Smoke pt, mm: 24

Gas oil

Range, °F: 400-650
Yield, vol %: 25.4
Gravity, °API: 38.2
Sulfur, wt %: 0.082
Aniline pt, °F: 161.1
Diesel index: 61.6
Cetane index: 55.1
Cloud pt, °F: 10
Pour pt, °F: 4
Vis., SUS @ 100° F: 35.2
Total nitrogen, wt %: 0.009

Residue

Range, °F: 650+
Yield, vol %: 36.6
Gravity, °API: 23.7
Sulfur, wt %: 0.5
Pour pt, °F: 80
Total nitrogen, wt %: 0.136
Rams carbon, wt %: 3.3
Vis., SUS @ 122° F: 334.6
@ 210° F: 67.1
V/Ni, ppm: 4.4

Murchison, U.K. & Norway, North Sea

Brent system to Sullom Voe terminal

Crude

Gravity, °API: 38.0
Kin vis., @ 100° F: 3.60
Con. carbon residue, wt %: 1.1
Sulfur, wt %: 0.27
V/Ni, ppm: 250.7
Pour pt, °C: -7.2
Rvp, psi: 9.0
C₄ & lighter, vol %: 3.0

Naphtha

Range (TBP), °F: 86-375
Yield, vol %: 31.2
Paraffins, vol %: 55.5
Naphthenes, vol %: 32.8
Sulfur, wt %: <0.01

Kerosine

Range, °F: 375-520
Yield, vol %: 13.5
Gravity, °API: 42.2
Sulfur, wt %: 0.02
Aromatics, vol %: 17

Heavy distillate

Range, °F: 520-700
Yield, vol %: 21.4
Gravity, °API: 34.1
Sulfur, wt %: 0.16

Gas oil

Range, °F: 700-1,020
Yield, vol %: 21.0
Gravity, °API: 25.8
Sulfur, wt %: 0.43

Residue

Range, °F: 1,020+
Yield, vol %: 11.9
Gravity, °API: 13.7
Sulfur, wt %: 0.93
Kin vis., @ 210° F: 196
Con. carbon residue, wt %: 11.8
V/Ni, ppm: 18/5

Ninian Blend, U.K. North Sea

Ninian system to Sullom Voe terminal

Crude

Gravity, °API: 35.6
Sulfur, wt %: 0.43
Vis., cSt @ 40° C: 5.61
Pour pt, °F: 35
C₄ & lighter, vol %: 2.6

Light gasoline

Range, °F: C₆-300
Yield, vol %: 19.9
Density, kg/l: 0.726
Sulfur, wt %: 0.001
Paraffins, vol %: 63
Naphthenes, vol %: 27
Aromatics, vol %: 10

Naphtha

Range, °F: 300-400
Yield, vol %: 9.3
Density, kg/l: 0.788
Sulfur, wt %: 0.006
Smoke pt, mm: 27
Aniline pt, °F: 128
P/N/A, vol %: 44/40/16

Kerosine

Range, °F: 400-500
Yield, vol %: 11.1
Density, kg/l: 0.828
Sulfur, wt %: 0.047
Smoke pt, mm: 21
Freeze pt, °F: -33
Cloud pt, °F: -40
Pour pt, °F: -40
Aniline pt, °F: 143

Diesel oil

Range, °F: 500-650
Yield, vol %: 14
Density, kg/l: 0.852
Sulfur, wt %: 0.23
Cloud pt, °F: 20
Pour pt, °F: 20
Aniline pt, °F: 164

Gas oil

Range, °F: 650-815
Yield, vol %: 13.1
Density, kg/l: 0.883
Sulfur, wt %: 0.46
Nitrogen, wt %: 0.05
Pour pt, °F: 75
Aniline pt, °F: 184
Vis., cSt @ 50° C: 10.7

Heavy gas oil

Range, °F: 815-1,000
Yield, vol %: 14.0
Density, kg/l: 0.906
Sulfur, wt %: 0.60
Nitrogen, wt %: 0.10
Pour pt, °F: 110
Aniline pt, °F: 205
Vis., cSt @ 50° C: 71.3

Residue

Range, °F: 1,000+
Yield, vol %: 16.0
Density, kg/l: 0.982
Sulfur, wt %: 1.2
Nitrogen, wt %: 0.40
Carbon residue, wt %: 11.7
Vis., cSt @ 100° C: 291
V/Ni, ppm: 24/4

Note: This assay prepared when Heather field made up of 10% Ninian Blend. Magnus field is scheduled to contribute to Ninian system in mid 1983.

Statfjord, Norway & UK, North Sea

"A" and "B" SPM buoys in producing area

Crude

Gravity, °API: 38.4
Pour pt, °F: 40
Kin. vis., @ 59° F: 7.33
Con. carbon residue, wt %: 1.32
Sulfur, wt %: 0.27
Rvp, psi: 5.5
Total nitrogen, ppm: 1.03
V/Ni, ppm: 0.53/1.03
C₅ & lighter, vol %: 5.08

Naphtha

Range (TBP), °F: 60-100
Yield, vol %: 6.49
Sp gr, 60° F/60° F: 0.6740
Rvp, psi: 10.3
Paraffins, vol %: 80.1
Naphthenes, vol %: 17.8
Aromatics, vol %: 2.1

Naphtha

Range, °F: 100-160
Yield, vol %: 22.12
Sp gr 0.7603
P/N/A: 48.9/37.3/13.8
RON, clear: 51.3
RON + 3 ml TEL: 74.2
Sulfur, wt %: 0.0037

Kerosine

Range, °F: 360-503
Yield, vol %: 15.08
P/N/A, vol %: 48.1/34.6/17.2
Freeze pt, °F: -47
Cloud pt, °F: -52
Smoke pt, mm: 20
Aniline pt, °F: 142.4
Diesel index: 60
Cetane index: 49
Sulfur, wt %: 0.03

Light gas oil

Range, °F: 503-710
Yield, vol %: 22.22
Sp gr, 60° F/60° F: 0.8526
Gravity, °API: 34.5
Pour pt, °F: 25
Aniline pt, °F: 166

Heavy gas oil

Range, °F: 710-946
Yield, vol %: 22.09
Gravity, °API: 25.6
Pour pt, °F: 105
Kin. vis., cSt @ 100° F: 66.27
Aniline pt, °F: 200
Sulfur, wt %: 0.40
Basic nitrogen, ppm: 375
Con. carbon residue, wt %: 0.07

Residue

Range, °F: 946+
Yield, vol %: 9.84
Gravity, °API: 14.2
Pour pt, °F: 120
Kin. vis., cSt @ 100° F: 24,732.61
Sulfur, wt %: 0.74
Total nitrogen, ppm: 1,750
Con. carbon, wt %: 10.58
V/Ni, ppm: 8.1/5.7

Note: This assay is on production from Statfjord "A" platform. Statfjord "B" began operation in November 1982.

Tartan, U.K. North Sea Flotta system

Crude

Gravity, °API: 41.7
Sulfur, wt %: 0.56
Vis., cSt @ 40° F.: 11.6
Pour pt, °F.: 16
C₃ & lighter, vol %: 3.5
Rvp @ 100° F., psi: 10.2

Naphtha

Range, °F.: C₅-149
Yield, vol %: 5.7
Sulfur, wt %: 0.001
Paraffins, vol %: 97.0
Naphthenes, vol %: 1.5
Aromatics, vol %: 1.0
RON, clear: 70.2

Naphtha

Range, °F.: 149-302
Yield, vol %: 20.0
Gravity, °API: 58.5
Sulfur, wt %: 0.01
PNA, vol %: 56.5/25.5/17.5
RON, clear: 56.6

Naphtha

Range, °F.: 302-356
Yield, vol %: 7.1
Gravity, °API: 49.4
Sulfur, wt %: 0.06
PNA, vol %: 50.30/19.5

Kerosine

Range, °F.: 356-455
Yield, vol %: 10.8
Gravity, °API: 44.0
Sulfur, wt %: 0.1
Aromatics, vol %: 23.5
Smoke pt, mm: 20
Freeze pt, °F.: -52
Aniline pt, °F.: 135

Gas oil

Range, °F.: 455-572
Yield, vol %: 12.3
Gravity, °API: 37.3
Sulfur, wt %: 0.32
Aromatics, vol %: 28.0
Aniline pt, °F.: 149

Gas oil

Range, °F.: 572-650
Yield, vol %: 8.3
Gravity, °API: 34.0
Sulfur, wt %: 0.64
Aromatics, vol %: 32.0
Aniline pt, °F.: 167

Residue

Range, °F.: 650+
Yield, vol %: 32.3
Gravity, °API: 23.1
Sulfur, wt %: 1.22
Vis., cSt @ 122° F.: 55.5
Con. carbon residue, wt %: 2.5
V/Ni/Fe, ppm: 6.0/2.0/4.0

Note: Tartan is part of Flotta Blend.

Thistle, U.K. North Sea Brent system to Sullom Voe terminal

Crude

Gravity, °API: 37.03
Vis., cSt @ 20° C.: 5.87
@ 37.8° C.: 4.26
Pour pt, °C.: 12
Rvp, psig: 7.5
H₂S, wt %: <0.01
Acid no., mg KOH/g: <0.05
Sulfur, wt %: 0.31

Wax, wt %: 7.7

Asphaltenes, wt %: 0.19

C₄—, wt % on crude (GLC): 0.69

Gasoline

Range, °C.: C₅-85
Yield, vol %/wt %: 7.0/5.6
Density @ 15° C., g/cc: 0.6771
Sulfur, wt %: <0.01
RON, clear/0.5 g TEL per liter: 71.6/84.7
PONA, wt %: 64.0/Nil/25/11.0

Naphtha

Range, °C.: 85-165
Yield, vol %/wt %: 16.6/15.0
Density @ 15° C., g/cc: 0.7547
Sulfur, wt %: <0.01
PONA, wt %: 44.5/Nil/42.9/12.6

Kerosine

Range, °C.: 165-235
Yield, vol %/wt %: 12.6/11.9
Density @ 15° C., g/cc: 0.7984
Sulfur, wt %: 0.02
Smoke pt, mm: 24
Freeze pt, °C.: -51
Aniline pt, °C.: 58.7
Aromatics, vol %: 15.0

Light gas oil

Range, °C.: 235-300
Yield, vol %/wt %: 12.9/12.9
Density @ 15° C., g/cc: 0.8393
Sulfur, wt %: 0.06
Vis., cSt @ 37.8° C.: 2.46
Cetane index: 49.5
Pour pt, °C.: -24
Cloud pt, °C.: -22
Aniline pt, °C.: 65.9
Con. car. residue (on 10% residue), wt %: 0.004

Heavy gas oil

Range, °C.: 300-350
Yield, vol %/wt %: 9.6/9.8
Density @ 15° C., g/cc: 0.8494
Sulfur, wt %: 0.21
Vis., cSt @ 37.8° C.: 5.47
Cetane index: 58.5
Pour pt, °C.: 0
Cloud pt, °C.: 1
Aniline pt, °C.: 77.9
Con. car. residue (on 10% residue), wt %: 0.039

Residue

Range, °C.: 350+
Yield, vol %/wt %: 39.8/43.8
Density @ 15° C., g/cc: 0.9217
Sulfur, wt %: 0.63
Vis., cSt @ 98.9° C.: 14.77
Pour pt, °C.: 39
Asphaltenes, wt %: 0.95
Con. car. residue, wt %: 4.6
V/Ni: ppm: 7.5/1.9
-30

West African

Bonny Light, Nigeria

Bonny shore terminal and
Bonny marine SBM (12 miles
offshore in Atlantic)

Crude

Gravity, °API: 36.7
Sulfur, wt %: 0.12
Salt, lb/1,000 bbl: 12
Wax, wt %: 7.5
Carbon residue, wt %: 1.0
V/Ni, ppm wt: <2/3
Vis., cSt @ 37.8° C.: 3.47
Yield C₁—C₄, wt %: 2.10

Naphtha

Range (TBP), °C.: C₅—149
Yield, vol %: 20.85
Sulfur, wt %: 0.002
Watson K factor: 12.2
RON, clear: 68.5
RON + 0.44 ml TEL/l: 81.5
Paraffins, wt %: 42.6
Naphthenes, wt %: 47.6
Aromatics, wt %: 9.8

Kerosine

Range, °C.: 149—232
Yield, vol %: 16.8
Sulfur, wt %: 0.020
Aromatics, vol %: 17
Smoke pt, mm: 21
Freeze pt, °C.: -61
Aniline pt, °C.: 53
Diesel index: 54
Cetane index: 39

Gas oil

Range, °C.: 232—342
Yield, vol %: 27.1
Sulfur, wt %: 0.10
Cloud pt, °C.: -11
Pour pt, °C.: -12
Wax, wt %: 5.5
Aniline pt, °C.: 67
Diesel index: 51
Cetane index: 49

Heavy gas oil

Range, °C.: 342—509
Yield, vol %: 19.6
Sulfur, wt %: 0.22
Vis., cSt @ 37.8° C.: 56.4
Pour pt, °C.: 39
Wax, wt %: 26
Total nitrogen, ppm wt: 1,180
Watson K factor: 11.9
Aniline pt, °C.: 86

Residue

Range, °C.: 342+
Yield, vol %: 32.6
Sulfur, wt %: 0.25
Vis., cSt @ 37.8° C.: 115
Pour pt, °C.: 39
Wax, wt %: 22
Total nitrogen, wt %: 0.24
Carbon residue, wt %: 2.7
V/Ni, ppm wt: 1/9
Watson K factor: 11.85

Note: Numerous fields contribute to Bonny Light and Medium blends, whose qualities are also influenced by national output. Analysis is on sample taken during period of high production.

Bonny Medium, Nigeria

Bonny shore terminal and
Bonny marine CALM (12
miles offshore in Atlantic)

Crude

Gravity, °API: 25.2
Sulfur, wt %: 0.23
Vis., cSt @ 37.8° C.: 12.1
Pour pt, °C.: -27
Carbon residue, wt %: 1.7
V/Ni, ppm wt: <1/7
C₁—C₄ yield, wt %: 0.52

Naphtha

Range (TBP), °C.: C₅—149
Yield, vol %: 6.31
Sulfur, wt %: 0.003
RON, clear: 73.5
RON + 0.44 ml TEL/l: 85.5
Paraffins, wt %: 32.8
Naphthenes, wt %: 54.7
Aromatics, wt %: 12.5

Kerosine

Range, °C.: 149—232
Yield, vol %: 12.85
Sulfur, wt %: 0.038
Aromatics, vol %: 16.5
Smoke pt, mm: 19
Freeze pt, °C.: < -70
Aniline pt, °C.: 49
Diesel index: 44
Cetane index: 32

Gas oil

Range, °C.: 232—343
Yield, vol %: 34.3
Density @ 15° C., kg/l: 0.889
Sulfur, wt %: 0.16
Vis., cSt @ 37.8 °C.: 4.7
Cloud pt, °C.: -32
Pour pt, °C.: -33
Aniline pt, °C.: 55
Diesel index: 36
Cetane index: 38

Heavy gas oil

Range, °C.: 369—509
Yield, vol %: 25.6
Density @ 15° C., kg/l: 0.9405
Sulfur, wt %: 0.31
Vis., cSt @ 37.8 °C.: 162
Pour pt, °C.: 24
Total nitrogen, ppm wt: 1,790
Aniline pt, °C.: 72

Residue

Range, °C.: 342+
Yield, vol %: 45.95
Density @ 15° C., kg/l: 0.953
Sulfur, wt %: 0.37
Vis. @ 37.8 °C.: 515
Pour pt, °C.: 24
Carbon residue, wt %: 3.5
V/Ni, ppm wt: 2/15

Note: See note at end of Bonny Light assay.

Brass River, Nigeria

CALM some 12 miles off mouth of Brass

Crude

Gravity, °API @ 60° F.: 40.9
Sulfur, wt %: 0.09
Pour test, °F.: +35
Vis., SUS @ 70° F.: 38.66
Rvp, psi @ 100° F.: 6.9
Salt, lb/1,000 bbl: 3.8
V/Ni, ppm: 2.0/1.7
C₄ & lighter yield, vol %: 1.9

Gasoline

Range, °F.: 60—200
Yield, vol %: 11.2
Total sulfur, wt %: 0.001
RON, clear: 74.6
RON + 3 ml TEL/gal: 92.2
Rvp, psi: 12.4

Naphtha

Range, °F.: 200—300
Yield, vol %: 16.6
Paraffins, vol %: 44.97
Naphthenes, vol %: 43.52
Aromatics, vol %: 11.51
Total sulfur, wt %: <0.001

Naphtha

Range, °F.: 300—400
Yield, vol %: 11.5
P/N/A, vol %: 45.78/38.45/15.77
Total sulfur, wt %: 0.0087
Aniline pt, °F.: 128.0
Smoke pt, mm: 26

Kerosine

Range, °F.: 400—500
Yield, vol %: 16.9
Freezing pt, °F.: -36
P/N/A, vol %: 45.9/37.2/16.9
Total sulfur, wt %: <0.05
Aniline pt, °F.: 146.2
Smoke pt, mm: 20

Gas oil

Range, °F.: 500—650
Yield, vol %: 15.7
Gravity, °API: 33.9
Vis., SUS @ 100° F.: 41.41
Pour pt, °F.: +30
P/N/A, vol %: 47.0/32.1/20.9
Total sulfur, wt %: 0.06
Aniline pt, °F.: 167.2
Cetane index (determined): 57.4

Residue

Range, °F.: 650+
Yield, vol %: 26.5
Vis., SUS @ 210° F.: 53.55
Pour pt, °F.: +105
Total sulfur, wt %: 0.14
Rams. carbon residue, wt %: 2.31
V/Ni/Fe, ppm: 6.6/5.7/5.8

Heavy gas oil

Range (vac. flash), °F.: 625—1,100
Yield, vol %: 24.7
Aniline pt, °F.: 190.1
Vis., SUS @ 130° F.: 127.55
Pour pt, °F.: +105
Sulfur, wt %: 0.33
Rams. carbon res., wt %: 0.67
V/Ni/Fe, ppm: 0.2/1.2/<0.2
Nitrogen, wt %: 0.139

Cabinda, Angola

CALM in producing area off Malongo terminal, Cabinda

Crude

Gravity, °API: 31.7
Sulfur, wt %: 0.17
Vis., SUS @ 100° F.: 93.5
Pour pt, °F.: +65
C₄ & lighter, vol %: 1.58
Rvp, psi: 3.8
V/Ni, ppm: 2.4/15.9
Salt, lb/1,000 bbl: 18
ASTM, 50% pt, °F.: >590

Light naphtha

Range (TBP), °F.: 1bp—140°
Yield, vol %: 2.18
Sulfur, wt %: 0.024
RON, clear: 77.3

Light naphtha

Range, °F.: 140—170
Yield, vol %: 1.67
Sulfur, wt %: 0.018
Paraffins, vol %: 77.6
Naphthenes, vol %: 21.4
Aromatics, vol %: 1.0
RON, clear: 65.1

Heavy naphtha

Range, °F.: 170—310
Yield, vol %: 9.98
Sulfur, wt %: 0.06
P/N/A, vol %: 50.0/44.8/5.2
Aniline pt, °F.: 134.4

Kerosine

Range, °F.: 310—520
Yield, vol %: 16.27
Gravity, °API: 43.7
Sulfur, wt %: 0.08
Freezing pt, °F.: -42
Aniline pt, °F.: 148.5

Cetane index: 50.8

Smoke pt, mm: 25

Light gas oil

Range, °F.: 520—680
Yield, vol %: 15.83
Gravity, °API: 34.9
Vis., SUS @ 100° F.: 44.4
Sulfur, wt %: 0.14
Pour pt, °F.: +35
Diesel index: 61.2
Cetane index: 60.5

Heavy gas oil

Range (TBP to EFV), °F.: 680—1,000
Yield, vol %: 29.34
Gravity, °API: 25.8
Vis., SUS @ 210° F.: 55.6
Sulfur, wt %: 0.16
Total nitrogen, ppm: 1,400
Pour pt, °F.: +115
Aniline pt, °F.: 210.2
V/Ni, ppm: >0.1/0.4

Residual oil

Range, °F.: 680+
Yield, vol %: 52.87
Gravity, °API: 20.4
Vis., SUS @ 210° F.: 210
Sulfur, wt %: 0.24
Con. carbon res., wt %: 5.82
Pour pt, °F.: +95
V/Ni, ppm: 4.2/28

*Does not include C₄ and lighter

Djeno Blend, Congo (Brazzaville)

CALM located 3.8 km from Djeno tank farm

Crude

Gravity, °API: 26.87
Vis., cSt @ 10° C.: 220
Pour pt, °C.: +3
Rvp @ 37.8° C., g/sq cm: 290
Total sulfur, wt %: 0.33
Acidity, mg KOH/g: 1.10
UOP charac. factor: 12.0
V/Ni, kg/mg: <1/23
Yield C₁—C₅, vol %: 2.37

Gasoline

Range, °C.: 15—80
Yield, vol %: 2.59
RON, clear: 69.0
Sulfur, wt %: 0.0876
Aromatics, vol %: 1.3

Naphtha

Range, °C.: 80—180
Yield, vol %: 11.86
Paraffins, vol %: 52.5
Naphthenes, vol %: 39.8
Aromatics, vol %: 7.7
Sulfur, wt %: 0.16

Kerosine

Range, °C.: 180—225
Yield, vol %: 5.90
Freezing pt, °C.: -51
Smoke pt, mm: 20
Sulfur, wt %: 0.20
Aromatics, vol %: 12.5

Gas oil

Range, °C.: 225—350
Yield, vol %: 21.88
Pour pt, °C.: -10
Cloud pt, °C.: -7
Sulfur, wt %: 0.17

Heavy gas oil

Range, °C.: 400—550
Yield, vol %: 21.88
Density 15/4 °C.: 0.926
Pour pt, °C.: +39
Vis., cSt @ 50° C.: 185
V/Ni, ppm: <0.5/<1
Sulfur, wt %: 0.25
Nitrogen, ppm: 944
Aniline pt, °C.: 95.7
Con. carbon residue, wt %: 0.60

Residue

Range, °C.: 350+
Yield, vol %: 57.42
Density, 15/4 °C.: 0.952
Pour pt, °C.: +30
Vis., cSt @ 50° C.: 1,850
Sulfur, wt %: 0.41

Escravos, Nigeria**CALM in offshore producing area****Crude**

Gravity, °API: 36.2
Sulfur, wt %: 0.14
Vis., SUS @ 100° F.: 37.6
Pour pt, °F.: +10
C₄ & lighter, vol %: 2.24
Rvp, lb: 4.3
V/Ni, ppm: 0.3/3.8
Salt, lb/1,000 bbl: 1
Uncondensed gases, vol %: 1.95

Light naphtha

Range (TBP), °F.: 1bp—140
Yield, vol %: 2.82
Gravity, °API: 88.0
Sulfur, wt %: 0.015
RON, clear: 82.6

Light naphtha

Range (TBP), °F.: 140—170
Yield, vol %: 1.60
Gravity, °API: 74.5
Sulfur, wt %: 0.009
P/N/A, vol %: 72.0/24.6/3.4
RON, clear: 75.0

Heavy naphtha

Range (TBP), °F.: 170—310
Yield, vol %: 16.13
Gravity, °API: 55.6
Sulfur, wt %: 0.013
P/N/A, vol %: 41.6/46.5/11.9
Aniline pt, °F.: 113.9

Kerosine

Range (TBP), °F.: 310—520
Yield, vol %: 28.55
Gravity, °API: 39.5
Sulfur, wt %: 0.06
Freezing pt, °F.: -51
Aniline pt, °F.: 131.4
Cetane index: 38.5
Smoke pt (ASTM), mm: 15

Light gas oil

Range (TBP), °F.: 520—680
Yield, vol %: 19.17
Gravity, °API: 31.1
Vis., SUS @ 100° F.: 44.9
Sulfur, wt %: 0.19
Pour pt, °F.: +30
Diesel index: 49.9
Cetane index: 47.0

Heavy gas oil

Range (TBP or EFV), °F.: 680—1,000
Yield, vol %: 23.76
Gravity, °API: 22.4
Vis., SUS @ 210° F.: 56.1
Sulfur, wt %: 0.22

Nitrogen (total), ppm: 1,700

Pour pt, °F.: +120
Aniline pt, °F.: 190.0
V/Ni, ppm: >0.1/0.9

Residual oil

Range (TBP or EFV), °F.: 680+
Yield, vol %: 29.78
Gravity, °API: 19.9
Vis., SUS @ 210° F.: 93.5
Sulfur, wt %: 0.27
Con. carbon residue, wt %: 3.72
Pour pt, °F.: +115
V/Ni, ppm: 1.0/11.5

Espoir, Ivory Coast**CALM yoke with permanent floating storage in producing area****Crude**

Gravity, °API: 31.4
Sp gr @ 60° F.: 0.8686
Sulfur, wt %: 0.32
Pour test, °F.: +5
Vis., SUS @ 70° F.: 69.78
Rvp @ 100° F., psi: 5.5
Salt lb/1,000 bbl: 15.0
Yield, NC₄ & lighter, vol %: 0.8
V/Ni, ppm: 1.7/5.8

Gasoline

Range, °F.: 60—200
Yield, vol %: 4.5
Total sulfur, wt %: <0.001
RON, clear (calc.): 73.6

Naphtha

Range, °F.: 200—300
Yield, vol %: 10.9
Total sulfur, wt %: 0.0049
Aniline pt, °F.: 118.5

Naphtha

Range, °F.: 300—400
Yield, vol %: 9.4
Paraffins, vol %: 43.42
Naphthenes, vol %: 48.19
Aromatics, vol %: 8.39
Total sulfur, wt %: 0.036
Aniline pt, °F.: 121.5
Smoke pt, mm: 25

Kerosine

Range, °F.: 400—500
Gravity, °API: 36.1
Vis., SUS @ 100° F.: 32.84
Freezing pt, °F.: -56
P/N/A, vol %: 26.3/50.9/22.8
Sulfur, wt %: 0.07
Aniline pt, °F.: 136.1
Smoke pt, mm: 19

Light gas oil

Range, °F.: 500—650
Yield, vol %: 17.1
Gravity, °API: 30.7
Vis., SUS @ 100° F.: 45.28
Pour pt, °F.: +10
P/N/A, vol %: 28.3/49.8/21.9
Total sulfur, wt %: 0.22
Aniline pt, °F.: 157.4

Vacuum gas oil

Range, °F.: 620—1,000
Yield, vol %: 25.7
Gravity, °API: 23.3
Aniline pt, °F.: 192.1
Vis., SUS @ 130° F.: 152.01
Pour pt, °F.: +90
Sulfur, wt %: 0.39
Rams. carbon res., wt %: 0.15
V/Ni, ppm: 0.1/0.2
Nitrogen, wt %: 0.086

Residue

Range, °F.: 650+
Yield, vol %: 42.9
Vis., SUS @ 210° F.: 125.43
Pour pt, °F.: +80
Total sulfur, wt %: 0.565
Rams. carbon res., wt %: 3.69
Nitrogen, wt %: 0.225
V/Ni, ppm: 3.8/12.6

Forcados Blend, Nigeria**CALMS some 7 miles off coast****Crude**

Gravity, °API: 29.7
Sulfur, wt %: 0.29
Pour pt, °C.: -20
Kin. vis., cSt @ 10° C.: 10.6
C₄ & lighter: 0.7

Light naphtha

Range, °C.: C₄—65
Yield, wt %: 1.4
Density @ 15° C., g/cu cm: 0.650
RON + 0.4 g Pb/l: 87.5

Heavy naphtha

Range, °C.: 65—175
Yield, wt %: 12.3
Density @ 15° C., g/cu cm: 0.765
RON + 0.4 g Pb/l: 75
Aromatics, vol %: 12.0
Naphthenes, vol %: 53

Kerosine

Range, °C.: 175—225
Yield, wt %: 9.0
Density @ 15° C., g/cu cm: 0.830
Sulfur, wt %: 0.04

Gas oil

Range, °C.: 225—360
Yield, wt %: 37.8
Density @ 15° C., g/cu cm: 0.880
Sulfur, wt %: 0.18
Pour pt, °C.: -17
Cold filter pour pt, °C.: -15
Kin. vis., cSt @ 100° C.: 1.46

Heavy gas oil

Range, °C.: 360—525
Yield, wt %: 28.6
Density @ 15° C.: 0.941
Sulfur, wt %: 0.40
Kin. vis., cSt @ 100° C.: 10.6

Residue

Range, °C.: 360+
Yield, wt %: 38.8
Density @ 15° C.: 0.953
Sulfur, wt %: 0.56
Kin. vis., cSt @ 100° C.: 22.1

Gamba, Gabon**Buoy 6 km offshore from Gamba tank farm****Crude**

Gravity, °API: 31.8
Vis., cSt @ 37.8° C.: 36.7
Pour pt, °C.: +23
Total sulfur, wt %: 0.11
Con. carbon, wt %: 3.10
UOP charac. factor: 12.20
Yield C₁—C₅, vol %: 1.42

Gasoline

Range, °C.: C₅—80
Yield, vol %: 1.3
Rvp, psi, g/sq cm: 800
RON, clear: 90
Sulfur, wt %: 0.0036

Heavy naphtha

Range, °C.: 80—160
Yield, vol %: 4.9
Density @ 15/4 °C.: 0.753
Paraffins, vol %: 46.9
Naphthenes, vol %: 50.6
Aromatics, vol %: 2.5
Sulfur, wt %: 0.0069

Kerosine

Range, °C.: 160—250
Yield, vol %: 11.8
Density @ 15/4 °C.: 0.808
Freezing pt, °C.: -52
Smoke pt, mm: 23
Sulfur, wt %: 0.014
Aniline pt, °C.: 64.2
Aromatics, vol %: 14.0

Gas oil

Range, °C.: 250—350
Yield, vol %: 19.3
Density @ 15/4 °C.: 0.838
Pour pt, °C.: -14
Cloud pt, °C.: -11
Vis., °Engler @ 20° C.: 1.58
Cetane index: 53
Sulfur, wt %: 0.057
Diesel index: 66
Aniline pt, °C.: 80.4

Residue

Range, °C.: +350
Yield, vol %: 62.0
Density @ 15/4 °C.: 0.900
Pour pt, °C.: +45
Vis., °Engler @ 50° C.: 18.9
Sulfur, wt %: 0.16

Kole Marine Blend, Cameroon

CALM with floating storage in offshore producing area

Crude

Gravity, °API: 34.89
Vis., cSt @ 10° C.: 11.1
Pour pt, °C.: -6
Total sulfur, wt %: 0.30
Rvp @ 37.8° C., g/sq cm: 445
Paraffins, wt %: 6.2
Con. carbon, wt %: 3.65
UOP charac. factor: 11.9
V/Ni, kg/mg: 9/27
C₁—C₅, yield, vol %: 6.12

Light gasoline

Range, °C.: 15—80
Yield, vol %: 5.71
RON, clear: 76.2

Heavy naphtha

Range, °C.: 80—180
Yield, vol %: 21.89
Density, 15/4 °C.: 0.765
Paraffins, vol %: 38.5
Naphthenes, vol %: 53.3
Aromatics, vol %: 8.2
Sulfur, wt %: 0.0080

Kerosine

Range, °C.: 180—225
Yield, vol %: 8.21
Density @ 15/4 °C.: 0.819
Freeze pt, °C.: -63
Smoke pt, mm: 20
Sulfur, wt %: 0.0467
Aromatics, vol %: 13.4

Gas oil

Range, °C.: 150—400
Yield, vol %: 43.89
Density @ 15/4 °C.: 0.839
Pour pt, °C.: -9
Vis., cSt @ 50° C.: 2.6
Cetane index: 52.0
Sulfur, wt %: 0.16

Gas oil

Range, °C.: 180—350
Yield, vol %: 30.46
Density @ 15/4 °C.: 0.838
Pour pt, °C.: -22
Sulfur, wt %: 0.15

Residue

Range, °C.: 350 +
Yield, vol %: 38.91
Density @ 15/4 °C.: 0.947
V/Ni, ppm: 20/68
Pour pt, °C.: +33
Vis. @ 50° C.: 425
Ash, wt %: 0.05
Sulfur, wt %: 0.54

Lucina Marine, Gabon

CALM with floating storage in offshore producing area

Crude

Gravity, °API: 39.52
Vis., cSt @ 20° C.: 16.00
Pour pt, °C.: +15
Rvp @ 37.8° C., g/sq cm: 450
Total sulfur, wt %: 0.05
Asphaltenes, wt %: 0.06
UOP charac. factor: 12.25
V/Ni, kg/mg: 1.3/12.2

Gasoline

Range, °C.: C₅—80
Yield, vol %: 5.56
Rvp, g/sq cm: 698
RON, clear: 66.3

Heavy gasoline

Range, °C.: 80—150
Yield, vol %: 13.46
Paraffins, vol %: 54.3
Naphthenes, vol %: 37.8
Aromatics, vol %: 7.9
Sulfur, wt %: 0.005

Kerosine

Range, °C.: 150—225
Yield, vol %: 14.38
Density @ 15/4 °C.: 0.778
Freeze pt, °C.: -55
Vis., cSt @ 34.4° C.: 5.07
Smoke pt, mm: 21
Sulfur, wt %: 0.006
Aromatics, vol %: 10.6

Gas oil

Range, °C.: 150—350
Yield, vol %: 38.59
Density @ 15/4 °C.: 0.809
Pour pt, °C.: -18
Vis., °Engler @ 50° C.: 1.78
Cetane index: 60.0
Diesel index: 71.8
Sulfur, wt %: 0.010
Aniline pt, °C.: 74.2

Residue

Range, °C.: 350 +
Yield, vol %: 40.23
Density @ 15/4 °C.: 0.898
Pour pt, °C.: +36
Vis., cSt @ 50° C.: 86.4
Sulfur, wt %: 0.060
Asphaltenes, wt %: 0.08
Con. carbon, wt %: 2.96
V, ppm: 3

Mandji, Gabon

Cap Lopez terminal, loading berth, Prince's Bay

Crude

Gravity, °API: 30.5
Vis., cSt @ 10° C.: 44.0
Pour pt, °C.: +3
Rvp @ 37.8° C., g/sq cm: 270
Total sulfur, wt %: 1.10
Asphaltenes, wt %: 0.3
Con. carbon, wt %: 5.40
UOP charac. factor: 12.1
V/Ni, kg/mg: 48/50
C₁—C₅, yield, vol %: 4.46

Gasoline

Range, °C.: 15—80
Yield, vol %: 5.38
RON, clear: 74.2

Heavy naphtha

Range, °C.: 80—150
Yield, vol %: 9.63
Paraffins, vol %: 55.2
Naphthenes, vol %: 36.7
Aromatics, vol %: 8.1
Sulfur, wt %: 0.006

Kerosine

Range, °C.: 150—225
Yield, vol %: 10.37
Density @ 15/4 °C.: 0.795
Freeze pt, °C.: -53
Smoke pt, mm: 24
Sulfur, wt %: 0.101
Aromatics, vol %: 17.3
Aniline pt, °C.: 56.1

Gas oil

Range, °C.: 150—375
Yield, vol %: 36.12
Density @ 15/4 °C.: 0.839
Pour pt, °C.: -15
Vis., cSt @ 50° C.: 2.28
Cetane index: 55.1
Diesel index: 59.7
Sulfur, wt %: 0.4
Aniline pt, °C.: 69.3

Heavy gas oil

Range, °C.: 375—525
Yield, vol %: 23.10
Density @ 15/4 °C.: 0.909
Pour pt, °C.: +37
Vis., cSt @ 50° C.: 50
Nitrogen, ppm: 480
Aniline pt, °C.: 85.4
Ni, ppm: <1
Sulfur, wt %: 1.14
Con. carbon, wt %: 0.45

Residue

Range, °C.: 375 +
Yield, vol %: 46.96
Density @ 15/4 °C.: 0.952
V/Ni, ppm: 93/98
Pour pt, °C.: +36
Vis., cSt @ 50° C.: 2,100
Sulfur, wt %: 1.81
Asphaltenes, wt %: 0.49
Con. carbon, wt %: 10.2

Pennington, Nigeria

CALM with export from floating storage in offshore producing area

Crude

Gravity, °API: 36.6
Sulfur, wt %: 0.07

Vis., cSt @ 104° F.: 3.06
Pour pt., °F.: 43
C₄ & lighter, vol %: 1.5
Rvp @ 100° F., psi: 5.1
Con. carbon residue, wt %: 0.7
V/Ni, ppm: 2/1

Light naphtha
Range, °F.: C₅—200
Yield, vol %: 7.4
Sulfur, wt %: 0.001
Paraffins, vol %: 70.5
Naphthenes, vol %: 25.5
Aromatics, vol %: 3.5
RON, clear: 74.9

Heavy naphtha
Range, °F.: 200—340
Yield, vol %: 14.7
Sulfur, wt %: 0.001
P/N/A, vol %: 35.0/52.5/12.0
RON, clear: 55.5
Aniline pt., °F.: 118

Kerosine
Range, °F.: 340—470
Yield, vol %: 18.0
Gravity, °API: 40.6
Sulfur, wt %: 0.02
Vis., cSt @ 104° F.: 1.45
Smoke pt., mm: 19.5
Freeze pt., °F.: -69
Aniline pt., °F.: 135
Cloud pt., °F.: < -76

Gas oil
Range, °F.: 470—650
Yield, vol %: 31.7
Gravity, °API: 33.7
Sulfur, wt %: 0.05
Vis., cSt @ 104° F.: 3.72
Pour pt., °F.: -1.0
Aniline pt., °F.: 158
Cloud pt., °F.: 6.0

Vacuum gas oil
Range, °F.: 650—1,000
Yield, vol %: 23.4
Gravity, °API: 23.5
Sulfur, wt %: 0.15
Vis., cSt @ 122° F.: 28.9
Pour pt., °F.: 102
Aniline pt., °F.: 184
Con. carbon residue, wt %: 0.12
V/Ni, ppm: 2/<1

Residue
Range, °F.: 650+
Yield, vol %: 26.7
Gravity, °API: 21.8
Sulfur, wt %: 0.17
Vis., cSt @ 122° F.: 48.5
Pour pt., °F.: 91
Aniline pt., °F.: 179
Con. carbon residue, wt %: 2.3

Qua Iboe, Nigeria

CALM in offshore producing area

Crude
Gravity, °API: 35.8
Pour pt., °F.: 45
Kin. vis., cSt @ 59° F.: 6.76
@ 104° F.: 3.39
Con. carbon residue, wt %: 0.92
Aniline pt., °C.: 62.56
Sulfur, wt %: 0.12
Rvp, psi: 6.0
Nitrogen, total, ppm: 540
V/Ni, ppm: 0.3/3.3
C₅ & lighter, yield, vol %: 5.13

Light naphtha
Range (TBP), °F.: 60—180
Yield, vol %: 5.15

Rvp, psi: 10.3
Paraffins, vol %: 67.3
Naphthenes, vol %: 31.6
Aromatics, vol %: 1.1
Sulfur, wt %: 0.0008

Heavy naphtha
Range, °F.: 180—380
Yield, vol %: 25.14
Rvp, psi: 1.0
P/N/A, vol %: 34.6/55.3/10.1
RON, clear: 56.6
RON + 3 ml TEL/gal: 76.0
Sulfur, wt %: 0.026

Kerosine
Range, °F.: 330—444
Yield, vol %: 13.64
Gravity, °API: 41.2
P/N/A, vol %: 36.4/49.3/14.3
Freezing pt., °F.: -50
Smoke pt., mm: 20
Aniline pt., °F.: 132.1
Diesel index: 54
Cetane index: 39
Sulfur, wt %: 0.05

Light gas oil
Range, °F.: 380—710
Yield, vol %: 42.63
Gravity, °API: 33.1
Pour pt., °F.: 15
Aniline pt., °F.: 151.4
Sulfur, wt %: 0.11

Heavy gas oil
Range, °F.: 710—850
Yield, vol %: 12.18
Gravity, °API: 22.7
Pour pt., °F.: 95
Kin. vis., cSt @ 100° F.: 68.55
Aniline pt., °F.: 178.7
Diesel index: 41
Sulfur, wt %: 0.16
Nitrogen, total, ppm: 679
Con. carbon, wt %: 0.02

Residue
Range, °F.: 710+
Yield, vol %: 24.65
Gravity, °F.: 17.9
Pour pt., °F.: 110
Kin. vis., cSt @ 100° F.: 900.93
Sulfur, wt %: 0.23
Nitrogen, total, ppm: 1,604
Con. carbon residue, wt %: 3.36
V/Ni, ppm: 1.2/13.1

Salt Pond, Ghana

SALM with hawser-moored permanent storage in off-shore producing area

Crude
Gravity, °API: 37.4
Sulfur, wt %: 0.097
C₁—C₃ yield, vol %: 0.37

Gasoline
Range, °F.: 115—180
Yield, vol %: 9.23
RON, clear: 57.0

Gasoline
Range, °F.: 180—220
Yield, vol %: 2.90
RON, clear: 51.0

Naphtha
Range, °F.: 220—250
Yield, vol %: 2.50
RON, clear: 46.5

Naphtha
Range, °F.: 250—320

Yield, vol %: 7.20

Heavy naphtha
Range, °F.: 320—360
Yield, vol %: 4.30
Aniline pt., °F.: 138

Kerosine
Range, °F.: 360—500
Yield, vol %: 16.30
Gravity, °API: 43.7
Pour pt., °F.: -36
Sulfur, wt %: 0.020
Aniline pt., °F.: 148

Gas oil
Range, °F.: 500—600
Yield, vol %: 10.90
Gravity, °API: 37.3
Pour pt., °F.: 11
Sulfur, wt %: 0.030
Aniline pt., °F.: 163

Gas oil
Range, °F.: 600—650
Yield, vol %: 5.10
Gravity, °API: 34.4
Pour pt., °F.: 38
Sulfur, wt %: 0.070
Aniline pt., °F.: 173

Heavy gas oil
Range, °F.: 650—940
Yield, vol %: 21.20
Gravity, °API: 27.9
Sulfur, wt %: 0.110
Nitrogen, %: 0.0300

Vacuum bottoms
Range, °F.: 940+
Yield, vol %: 20.00
Gravity, °API: 17.6
Sulfur, wt %: 0.250
K factor: 11.89
Vis., Sfs @ 210° F.: 263.0

Soyo Blend, Angola

Quinfequena terminal

Crude
Gravity, °API: 33.7
Sulfur, wt %: 0.23
Pour pt., °C.: +18
Vis., cSt @ 37.8° C.: 10.08
Asphaltenes, wt %: 0.72
Total acidity, mg KOH/g: 0.07
Wax content, wt % @ -30° C.: 14.7
V/Ni, ppm: 5/15
C₁—C₅ (GLC), yield, wt %: 2.33

Gasoline
Range (TBP), °C.: C₅—80
Yield, vol %: 3.86
RON + 0.4 g TEL/l: 83.7

Heavy naphtha
Range, °C.: 80—150
Yield, vol %: 9.63
Density @ 15° C.: 0.745
Naphthenes, vol %: 37.2
Aromatics, vol %: 10

Kerosine
Range, °C.: 150—230
Density @ 15° C.: 0.793
Sulfur, wt %: 0.021
Freeze pt., °C.: -53
Aromatics, vol %: 16
Smoke pt., mm: 25
Naphthenic acids, ppm: 68

Gas oil
Range, °C.: 230—340
Yield, vol %: 19.99
Density @ 15° C.: 0.838

Sulfur, wt %: 0.12
Cloud pt, °C.: -8
Cetane index: 53.0
Vis., cSt @ 50° C.: 2.73

Heavy gas oil
Range, °C.: 340—510
Yield, vol %: 26.22
Density @ 15° C.: 0.8824
Sulfur, wt %: 0.24
Aniline pt, °C.: 94.0
Basic nitrogen, ppm: 298
Total nitrogen, wt %: 0.10
Con. carbon, wt %: 0.01
V/Ni, ppm: <2/<2

Residue
Range, °C.: 340 +
Yield, vol %: 52.16
Density @ 15° C.: 0.920
Sulfur, wt %: 0.21
Vis., cSt @ 50° C.: 160.8
Con. carbon, wt %: 5.5

Zaire, Zaire

*CALM with moored storage
in offshore producing area*

Crude
Gravity, °API: 31.7
Sulfur, wt %: 0.13
Vis., SUS @ 100° F.: 98.0
Pour pt, °F.: +80
C₄ & lighter, vol %: 1.00
Rvp, lb: 2.2
V/Ni, ppm: 1.5/17.8
Salt, lb/1,000 bbl: 6
ASTM, 50% pt, °F.: >590

Light naphtha
Range (TBP), °F.: lbp—140°
Yield, vol %: 1.84
Sulfur, wt %: 0.037
RON, clear: 79.4

Light naphtha
Range, °F.: 140—170
Yield, vol %: 1.03
Sulfur, wt %: 0.020
Paraffins, vol %: 76.5
Naphthenes, vol %: 22.2
Aromatics, vol %: 1.3
RON, clear: 65.7

Heavy naphtha
Range, °F.: 170—310
Yield, vol %: 8.84
Sulfur, wt %: 0.006
P/N/A, vol %: 53.8/41.6/4.6
Aniline pt, °F.: 133.5

Kerosine
Range, °F.: 310—520
Yield, vol %: 16.31
Sulfur, wt %: 0.074
Freezing pt, °F.: -36
Aniline pt, °F.: 147.2
Cetane index: 50.0
Smoke pt, mm: 27

Light gas oil
Range, °F.: 520—680
Yield, vol %: 15.44
Vis., SUS @ 100° F.: 45.0
Sulfur, wt %: 0.14
Pour pt, °F.: +45
Diesel index: 62.4
Cetane index: 62.0

Heavy gas oil
Range (TBP to EFV), °F.: 680—1,000
Yield, vol %: 31.39
Gravity, °API: 26.7
Vis., SUS @ 210° F.: 54.0
Sulfur, wt %: 0.12
Total nitrogen, ppm: 1,010
Pour pt, °F.: +115

Aniline pt, °F.: 214.3
V/Ni, ppm: 0.1/0.3

Residual oil
Range, °F.: 680 +
Yield, vol %: 55.65
Gravity, °API: 21.4
Vis., SUS @ 210° F.: 181.9
Sulfur, wt %: 0.17
Con. carbon res., wt %: 6.03
Pour pt, °F.: +100
V/Ni, ppm: 2.5/30
*Does not include C₄ and lighter

North Africa

**Amna (high pour),
Libya**

Ras Lanuf/CBMs & SPM

Crude
Gravity, °API: 36.1
Sulfur, wt %: 0.15
Pour pt, °F.: 75
Kin. vis., cSt @ 37.8° C.: 13.70
Car. residue (CCR), wt %: 3.7
Rvp, psi: 3.9
Salt, lb/1,000 bbl: 8.2
V/Ni, ppm: 0.6/5.0
lbp-60° F., yield, vol %: 2.11

Light naphtha
Range, °F.: 60-120
Yield, vol %: 2.4
Gravity, °API: 93.6
Sulfur, wt %: 0.01
Paraffins, vol %: 99.0
Naphthenes, vol %: 1.0
RON, clear: 78.0
RON + 3 ml TEL: 94.0

Light naphtha
Range, °F.: 120-250
Yield, vol %: 7.7
Gravity, °API: 69.5
Sulfur, wt %: 0.01
Paraffins, vol %: 69.9
Naphthenes, vol %: 26.5
Aromatics, vol %: 3.7

Heavy naphtha
Range, °F.: 250-330
Yield, vol %: 6.9
Gravity, °API: 57.4
Sulfur, wt %: 0.02
P/N/A, vol %: 60.5/33.6/5.9

Kerosine
Range, °F.: 330-443
Yield, vol %: 9.4
Gravity, °API: 49.9
Sulfur, wt %: 0.05
P/N/A, vol %: 60.9/29.9/9.2
Pour pt, °F.: -75
Freezing pt, °F.: -58
Aniline pt, °F.: 150.6
Diesel index: 75
Smoke pt, mm: 31

Gas oil
Range, °F.: 443-600
Yield, vol %: 15.0
Gravity, °API: 42.3
Sulfur, wt %: 0.07
Pour pt, °F.: 0
Aniline pt, °F.: 169.1
Diesel index: 71

Gas oil
Range, °F.: 600-850
Yield, vol %: 23.3
Sulfur, wt %: 0.13

Pour pt, °F.: 80
Aniline pt, °F.: 202.0
Diesel index: 69

Residual oil
Range, °F.: 655 +
Yield, vol %: 55.4
Gravity, °API: 25.4
Sulfur, wt %: 0.22
Pour pt, °F.: 100
Car. residue CCR, wt %: 6.22
V/Ni, ppm: 1.1/8.5

Residual oil
Range, °F.: 1,000 +
Yield, vol %: 21.8
Gravity, °API: 16.7
Sulfur, wt %: 0.31
Pour pt, °F.: 130
Car. residue CCR, wt %: 14.50
V/Ni, ppm: 2.5/20.0

Ashtart, Tunisia

*Floating storage barge in
Gulf of Gabes producing
area*

Crude
Gravity, °API: 29.03
Vis @ 20° C., cSt: 24.0
Pour pt, °C.: +9
Rvp @ 38.7° C., g/sq cm: 130
Total sulfur, wt %: 1.0
Paraffins/Asphaltenes, wt %: 11.0/1.8
Con. carbon, wt %: 5.4
>C₄-C₁₀, vol %: 1.26
V/Ni, mg/kg: 20.9

Light naphtha
Range (TBP), °C.: 15-100
Yield, vol %: 5.65
Density, 15/4 °C.: 0.702
Rvp, g/sq cm: 500
RON, clear: 63.6
Aromatics, vol %: 10.0

Heavy naphtha
Range (TBP), °C.: 100-145
Yield, vol %: 6.42
Density, 15/4 °C.: 0.759
Paraffins, vol %: 47.2
Naphthenes, vol %: 37.8
Aromatics, vol %: 15.0
Sulfur, wt %: 0.0055

Heavy naphtha
Range (TBP), °C.: 145-180
Yield, vol %: 5.91
Density, 15/4 °C.: 0.785
P/N/A, vol %: 46.5/33.8/19.7
Sulfur, wt %: 0.0120

Kerosine
Range (TBP), °C.: 180-225
Yield, vol %: 6.65
Density, 15/4 °C.: 0.812
Freeze pt, °C.: -54
Vis., cSt @ 50° C.: 1.10
Smoke pt, mm: 21
Sulfur, wt %: 0.04
Aniline pt, °C.: 54.0
Aromatics, vol %: 18.9

Gas oil
Range (TBP), °C.: 145-350
Yield, vol %: 36.04
Density, 15/4 °C.: 0.834
Pour pt, °C.: -21
Cloud pt, °C.: -16
Filterability, °C.: -19
Vis, cSt @ 50° C.: 1.9
Cetane index: 48.8
Sulfur, wt %: 0.44
Diesel index: 54.7
Aniline pt, °C.: 62.0
Con. carbon @ 10%, wt %: <0.05

Residue

Range (TBP), °C.: 350 +
Yield, vol %: 51.90
Density, 15/4 °C.: 0.943
Pour pt., °C.: +18
Vis. cSt @ 50° C.: 225
Sulfur, wt %: 1.42
Con. carbon, wt %: 9.4
V/Ni, ppm: 34/17
N, wt %: 0.40

Brega, Libya**Marsa el Brega/ CBM, SPM, SBM****Crude**

Gravity, °API: 40.4
Sulfur, wt %: 0.21
Pour pt., °F.: +30
Rvp, psi: 6.4
Kin. vis., cSt @ 70° F.: 5.58
@ 100° F.: 3.56

Light naphtha

Range, °F.: 68-212
Yield, vol %: 12.4
Gravity, °API: 73.8
Sulfur, wt %: 0.014
Rvp, psi: 7.4
Paraffins, vol %: 72.5
Naphthenes, vol %: 25.3
Aromatics, vol %: 2.2
RON, clear: 65.1

Heavy naphtha

Range, °F.: 212-302
Yield, vol %: 10.7
Gravity, °API: 56.8
Sulfur, wt %: 0.020
P/N/A, vol %: 53.1/39.4/7.5

Kerosine

Range, °F.: 302-455
Yield, vol %: 17.4
Gravity, °API: 46.7
Sulfur, wt %: 0.035
P/N/A, vol %: 51.2/34.7/14.1
Freeze pt., °F.: -70
Smoke pt, mm: 27
Luminometer no.: 61
Aniline pt., °F.: 144
Kin. vis., cSt @ 30° F.: 5.50
@ 100° F.: 1.17

Light gas oil

Range, °F.: 455-650
Yield, vol %: 20.3
Gravity, °API: 38.1
Sulfur, wt %: 0.10
Pour pt., °F.: +15
Aniline pt., °F.: 172
Kin. vis., cSt @ 100° F.: 3.61

Heavy gas oil

Range, °F.: 650-1,049
Yield, vol %: 27.8
Gravity, °API: 27.7
Sulfur, wt %: 0.30
Pour pt., °F.: 105
Aniline pt., °F.: 206
Kin. vis., cSt @ 150° F.: 14.9

Residual oil

Range, °F.: 650 +
Yield, vol %: 36.8
Gravity, °API: 23.6
Sulfur, wt %: 0.41
Pour pt., °F.: 95
Con. carbon wt %: 4.1
Kin. vis., cSt @ 100° F.: 184
@ 122° F.: 92.0

Residual oil

Range, °F.: 1,049 +

Yield, vol %: 9.0
Gravity, °API: 12.3
Sulfur, wt %: 0.69
Pour pt., °F.: >120
Con. carbon, wt %: 14.6
Kin. vis., cSt @ 210° F.: 620
V/Ni/Fe, ppm: 24/32/124

Bu Attifel, Libya**Zueitina/CBM & SBM****Crude**

Gravity, °API: 43.6
Rvp, psi: 0
Sulfur, wt %: 0.034
Pour pt., °F.: +90

Light ends

Range vapor temp., °F.: 1bp-160
Yield, vol %: 2.5

Light naphtha

Range, vapor temp., °E.: 160-290
Yield, vol %: 9.0
Gravity, °API: 62.5
Paraffins, vol %: 75.4
Olefins, vol %: 0.4
Naphthenes, vol %: 18.3
Aromatics, vol %: 5.9

Heavy naphtha

Range, VT, °F.: 290-390
Yield, vol %: 9.0
Gravity, °API: 56.8
Sulfur, wt %: 0.0015
P/O/N/A, vol %: 75.7/0.4/17.8/6.1

Kerosine

Range, VT, °F.: 390-500
Yield, vol %: 11.7
Gravity, °API: 50.3
Sulfur, wt %: 0.005
Aromatics, vol %: 5.6
Smoke pt, mm: 22
Freeze pt., °F.: 9.4
Pour pt., °F.: -10

Diesel

Range, VT, °F.: 500-635
Yield, vol %: 11.3
Gravity, °API: 44.0
Sulfur, wt %: 0.0140
Vis., SSU @ 100° F.: 38.4
Aniline pt., °F.: 192.5
Diesel index: 84.7
Pour pt., °F.: 45

Lt. gas oil

Range, VT, °F.: 635-775
Yield, vol %: 20.7
Gravity, °API: 41.6
Sulfur, wt %: 0.03
Vis., SSU @ 100° F.: 49.5
Pour pt., °F.: +85
UOP "K" factor: 12.6

Heavy gas oil

Range, VT, °F.: 775-932
Yield, vol %: 20.6
Gravity, °API: 37.4
Sulfur, wt %: 0.04
Vis., SSF @ 210° F.: 41.6
Pour pt., °F.: +125
UOP "K" factor: 12.8

Residue

Range, °F.: 932 +
Yield, vol %: 15.2
Gravity, °API: 29.2
Sulfur, wt %: 0.10
Carbon residue, wt %: 1.5

El Borma, Tunisia**La Skhirra, Tunisia****Crude**

See Algerian Zarzaitine assay. One blend has two names.

Es Sider, Libya**Es Sider/3 CBMs, 1 SBM****Crude**

Gravity, °API: 36.7
Kin. vis., cSt @ 100° F.: 5.26
Con. carbon residue, wt %: 1.8
Sulfur, wt %: 0.37
V/Ni, ppm: 1.5/5.6
Pour pt., °C.: +7.2
Rvp, psi: 6.3
C₄ & lighter, vol %: 2.3

Naphtha

Range (TBP), °F.: 82-342
Yield, vol %: 22.2
Gravity, °API: 64.8
Paraffins, vol %: 57.8
Naphthenes, vol %: 36.5
Sulfur, wt %: 0.03

Kerosine

Range (TBP), °F.: 342-472
Yield, vol %: 11.3
Gravity, °API: 46.3
Sulfur, wt %: 0.13
Aromatics, vol %: 13

Heavy distillate

Range (TBP), °F.: 472-705
Yield, vol %: 28.0
Gravity, °API: 35.7
Sulfur, wt %: 0.31

Gas oil

Range (TBP), °F.: 705-980
Yield, vol %: 20.3
Gravity, °API: 25.5
Sulfur, wt %: 0.48

Residue

Range (TBP), °F.: 980 +
Yield, vol %: 15.9
Gravity, °API: 12.3
Sulfur, wt %: 1.16
Kin. vis., cSt @ 210° F.: 500
Con. carbon residue, wt %: 14.7
V/Ni, ppm: 8/30

**Saharan Blend,*
Algeria****Arzew (3 CBMs)
Bejaia (4 jetties)
Skikda****Crude**

Gravity, °API: 45.5 (43.7)
Rvp, psi: 8.7 (8.1)
Sulfur, wt %: 0.053 (0.090)
Pour pt., °F.: <-20 (<-20)
Vis. SSU @ 70° F.: 37.3 (40.1)

Light ends

Range, vapor temp., °F.: 1bp-160
Yield, vol %: 10.4 (9.9)

Light naphtha
Range, vapor temp., °F.: 160-290
Yield, vol %: 18.3 (14.9)
Gravity, °API: 64.0 (63.7)
Paraffins, vol %: 70.8 (70.2)
Olefins, vol %: 0.3 (0.4)
Naphthenes, vol %: 21.8 (23.4)
Aromatics, vol %: 7.1 (6.0)

Heavy naphtha
Range, VT, °F.: 290-390
Yield, vol %: 13.7 (14.5)
Gravity, °API: 53.3 (52.1)
P/O/N/A, vol %: 47.4/0.3/36.4/15.9 (55.0/0.3/29.6/15.1)

Kerosine
Range, VT, °F.: 390-500
Yield, vol %: 14.1 (13.4)
Gravity, °API: 44.6 (44.0)
Sulfur, wt %: 0.0056 (0.0030)
Aromatics, vol %: 15.8 (16.4)
Smoke pt, mm: 17 (21)
Freeze pt, °F.: -38.2 (-42.7)

Diesel
Range, VT, °F.: 500-635
Yield, vol %: 12.7 (12.8)
Gravity, °API: 36.6 (35.1)
Sulfur, wt %: 0.0571 (0.0736)
Vis. SSU @ 100° F.: 41.6 (40.3)
Pour pt, °F.: +15 (+5)
Aniline pt, °F.: 170 (165.5)
Diesel index: 62.2 (58.1)

Light gas oil
Range, VT, °F.: 635-775
Yield, vol %: 9.3 (14.3)
Gravity, °API: 31.1 (31.7)
Sulfur, wt %: 0.07 (0.13)
Vis. SSU @ 100° F.: 57.5 (63.0)
Pour pt, °F.: +50 (+40)

Heavy gas oil
Range, VT, °F.: 775-932
Yield, vol %: 12.0 (10.0)
Gravity, °API: 28.6 (26.5)
Sulfur, wt %: 0.10 (0.18)
Vis., SSU @ 210° F.: 49.6 (54.5)
Pour pt, °F.: +90 (+90)
Carbon residue, wt %: 0.05 (0.06)

Residue
Range, VT, °F.: 932+
Yield, vol %: 9.5 (10.2)
Gravity, °API: 21.2 (19.9)
Sulfur, wt %: 0.22 (0.28)
Vis., SSF, @ 210° F.: 38.0 (45.1)
Carbon residue, wt %: 6.8 (7.4)

*Gravity of Saharan Blend has not been consistent. Values in parenthesis are those for 43.7 °API blend.

Sarir, Libya

Marsa al Hariga (Tobruk)/ CBM

Crude
Gravity, °API: 38.3
Sulfur, wt %: 0.18
Pour pt, °F.: 25
Kin. vis. cSt @ 50° C.: 4.73
Yield, C₂-C₄, vol %: 3.82
V/Ni, ppm: 6/14

Naphtha
Range, °C.: lbp-180
Yield, vol %: 22.89
Total sulfur, ppm: 14
Paraffins, vol %: 60.8
Naphthenes, vol %: 35.8
Aromatics, vol %: 3.4

Kerosine
Range, °C.: 180-250
Yield, vol %: 11.27
Total sulfur, ppm: 83
Smoke pt, mm: 30

Gas oil
Range, °C.: 250-320
Yield, vol %: 10.99
Total sulfur, wt %: 0.063
Pour pt, °C.: -6
Aniline pt, °C.: 80

Resid
Range, °C.: 320+
Yield, vol %: 51.41
Total sulfur, wt %: 0.24
Vis. cSt @ 60° C.: 49
Con. carbon, wt %: 6.8

Resid
Range, °C.: 550+
Yield, vol %: 17.25
Total sulfur, wt %: 0.35
Con. carbon, wt %: 20
Asphaltenes, wt %: 4.7

Sirtica, Libya

Ras Lanuf/CBMs & SBM

Crude
Gravity, °API: 43.3
Total sulfur, wt %: 0.43
Pour pt, °C.: -3
Yield C₂-C₄, wt %: 3.24
Rvp, psi: 10.1

Condensate
Yield, vol %: 42

Naphtha
Range, °C.: lbp-180
Yield, vol %: 39.7
Gravity, °API: 62.8
Total sulfur, wt %: 0.015
P/N/A, vol %: 69.7/22.8/7.5

Gas oil
Range, °C.: 180-350
Yield, vol %: 29.8
Gravity, °API: 38.7
Total sulfur, wt %: 0.21
Pour pt, °C.: -15

Resid
Range, °C.: 350+
Yield, vol %: 25.5
Gravity, °API: 19.1
Total sulfur, wt %: 1.16
Vis. cSt @ 180° F.: 39.0
Pour pt, °C.: 39
Con. carbon, wt %: 5.7

Zarzaitine, Algeria

La Skhirra, Tunisia

Crude
Gravity, °API: 43.0
Vis. cSt @ 10° C.: 6.90
Pour pt, °C.: -12
Rvp @ 37.8° C., g/sq cm: 603
Total sulfur, wt %: 0.07
Paraffins, wt %: 4.89
Con. carbon, wt %: 0.90
V/Ni, mg/kg: 1/3
Yield C₁-C₅, vol %: 7.31

Light naphtha
Range, °C.: C₅-80
Yield, vol %: 8.94

Density, 15/4 °C.: 0.662
RON, clear: 68.8
MON, clear: 64.6
Aromatics, vol %: 0.9

Heavy naphtha
Range, °C.: 80-145
Yield, vol %: 15.13
Density, 15/4 °C.: 0.738
Paraffins, vol %: 59.4
Naphthenes, vol %: 33.9
Aromatics, vol %: 6.7
Sulfur, wt %: 0.0138

Kerosine
Range, °C.: 145-225
Yield, vol %: 16.58
Density, 15/4 °C.: 0.784
Freeze pt, °C.: -65
Vis. cSt @ 34.4° C.: 4.50
Smoke pt, mm: 25
Sulfur, wt %: 0.0162
Aromatics, vol %: 14.2

Gas oil
Range, °C.: 225-290
Yield, vol %: 12.55
Density, 15/4 °C.: 0.822
Pour pt, °C.: -36
Cloud pt, °C.: -27
Filterability, °C.: -34
Vis. cSt @ 50° C.: 1.95
Sulfur, wt %: 0.025

Gas oil
Range, °C.: 290-350
Yield, vol %: 10.89
Density, 15/4 °C.: 0.843
Pour pt, °C.: -3
Vis. cSt @ 50° C.: 4.18
Sulfur, wt %: 0.045

Residue
Range, °C.: 350+
Yield, vol %: 32.47
Pour pt, °C.: +21
Density, 15/4 °C.: 0.899
Vis., cSt @ 50° C.: 80
Sulfur, wt %: 0.155
Asphaltenes, wt %: 0.21
Con. carbon, wt %: 2.48
V, ppm: 2.5

Zueitina, Libya

Zueitina/CBMs & SBM

Crude
Gravity, °API: 41.3
Rvp, psi: 4.6
Sulfur, wt %: 0.28
Pour pt, °F.: 45
Vis. SSU @ 60° F.: 199.1

Light ends
Range, °F.: lbp-113
Yield, vol %: 6.44

Light naphtha
Range, °F.: 113-220
Yield, vol %: 9.32
Gravity, °API: 66.9
Paraffins, vol %: 65.5
Naphthenes, vol %: 30.9
Aromatics, vol %: 3.6

Naphtha
Range, °F.: 220-390
Yield, vol %: 21.42
Gravity, °API: 53.9
Sulfur, wt %: 0.04
P/N/A, vol %: 59.2/27.0/10.2

Kerosine
Range, °F.: 315-500
Yield, vol %: 21.65

Gravity, °API: 45.6
Total sulfur, wt %: 0.11
Aromatics, vol %: 14.0
Smoke pt, mm: 27
Freeze pt, °F.: -36
Pour pt, °F.: -45

Light distillate

Range, °F.: 390-550
Yield, vol %: 18.16
Gravity, °API: 41.7
Cetane index: 53.0
Total sulfur, wt %: 0.17
Aniline pt, °F.: 159.0
Pour pt, °F.: -10

Light gas oil

Range, °F.: 450-650
Yield, vol %: 21.17
Gravity, °API: 38.4
Cetane index: 57.8
Total sulfur, wt %: 0.24
Total nitrogen, ppm: 78
Aniline pt, °F.: 173.0
Pour pt, °F.: 25

Heavy gas oil

Range, °F.: 650-1,000
Yield, vol %: 24.09
Gravity, °API: 29.1
Sulfur, wt %: 0.36
Total nitrogen, ppm: 922
Pour pt, °F.: 100
Carbon residue, wt %: 0.18

Vacuum flashed resid

Range, °F.: 1,000 +
Yield, vol %: 10.11
Gravity, °API: 13.5
Total sulfur, wt %: 0.90

Asia

Ardjuna, Indonesia

SBM 18.5 miles off north coast of Java in producing area

Crude

Gravity, °API: 35.2
Sulfur, wt %: 0.105
Pour pt, °F.: 75
Rvp, lb: 5.3
Kin vis @ 100° F.: 3.738
Carbon residue, wt %: 1.38
V/Ni, ppm: <13
Nitrogen, ppm: 280
Yield, C₄ & lighter, vol %: 2.6

Naphtha

Range (TBP), °F.: C₅-150
Yield, vol %: 5.0
Sulfur, wt %: 0.005
RON, clear: 76.6
RON + 0.5 g TEL/gal: 82.7
MON, clear: 74.8

Heavy naphtha

Range, °F.: 150-380
Yield, vol %: 27.2
Gravity, °API: 50.8
Sulfur, wt %: 0.012
Paraffins, vol %: 34.3
Naphthenes, vol %: 46.0
Aromatics, vol %: 19.7
RON, clear: 64.6
MON, clear: 63.0

Distillate

Range, °F.: 380-520
Yield, vol %: 16.4
Gravity, °API: 33.0
Sulfur, wt %: 0.059

Pour pt, °F.: -65
Cetane no.: 36.3
Smoke pt, °F.: 12.5
Freezing pt, °F.: -39.5
Aromatics, vol %: 34.6
Total N, ppm: 4.0
Cloud pt, °F.: -46
Vis., cSt @ 100° F.: 1.967

Distillate

Range, °F.: 520-650
Yield, vol %: 14.0
Gravity, °API: 30.7
Sulfur, wt %: 0.099
Pour pt, °F.: -65
Cetane no.: 47.0
Total N, ppm: 33.0
Cloud pt, °F.: -26
Vis., cSt @ 100° F.: 4.689

Blended gas oil

Range, °F.: 650-840
Yield, vol %: 16.9
Gravity, °API: 25.1
Sulfur, wt %: 0.156
Aniline pt, °C.: 86.7
Pour pt, °F.: 90
Kin vis @ 210° F.: 3.983
Carbon residue, wt %: 0.02
Total nitrogen, ppm: 200

Residue

Range, °F.: 650 +
Yield, vol %: 34.8
Gravity, °API: 21.1
Sulfur, wt %: 0.199
Carbon residue, wt %: 2.94
Total nitrogen, ppm: 670
Pour pt, °F.: 100
Kin vis @ 210° F.: 5.414

Vacuum residue

Range: Bottoms from vacuum flashed 650 +
°F resid @ 725° F.
Yield, vol %: 5.9
Gravity, °API: 5.1
Sulfur, wt %: 0.292
Carbon residue, wt %: 17.86
V/Ni, ppm: 7.30

Arimbi, Indonesia

Balangan sea terminal/SBM about 6.5 nautical miles off north coast of Java

Crude

Gravity, °API: 31.8
Sulfur, wt %: 0.204
Pour pt, °F.: 100
Vis., cSt @ 100° F.: 12.54
Carbon residue, wt %: 2.41
V/Ni, ppm: 0.926
Nitrogen, ppm: 531

Naphtha

Range (TBP), °F.: C₅-230
Yield, vol %: 10.6
Sulfur, wt %: <0.001
RON, clear: 64.6
RON + 0.5 g TEL/gal: 71.7

Naphtha

Range, °F.: 230-335
Yield, vol %: 11.2
Sulfur, wt %: 0.030
Total nitrogen, ppm: 1
Paraffins, vol %: 42.3
Naphthenes, vol %: 47.0
Aromatics, vol %: 10.7

Distillate

Range, °F.: 335-520
Yield, vol %: 17.3
Gravity, °API: 34.6
Sulfur, wt %: 0.107
Cetane no.: 37.3
Smoke pt, °F.: 14

Freezing pt, °F.: -32
Aromatics, vol %: 35.3

Distillate

Range, °F.: 520-650
Yield, vol %: 14.7
Gravity, °API: 31.6
Sulfur, wt %: 0.213
Pour pt, °F.: 45
Cetane no.: 50.2
Cloud pt, °F.: 50
Vis., cSt @ 100° F.: 5.450

Blended gas oil

Range, °F.: 650-840
Yield, vol %: 15.9
Gravity, °API: 29.0
Sulfur, wt %: 0.168
Aniline pt, °C.: 93.4
Pour pt, °F.: 110
Vis., cSt @ 210° F.: 4.385
Carbon residue, wt %: 0.008
Nitrogen, ppm: 266

Residue

Range, °F.: 650 +
Yield, vol %: 45.9
Gravity, °API: 20.5
Sulfur, wt %: 0.240
Carbon residue, wt %: 5.27
Total nitrogen, ppm: 1,010
Pour pt, °F.: 120 +
Vis @ 210° F. (D2170): 22.29
V/Ni, ppm: 2.798

Attaka, Indonesia

Santan marine terminal about 80 miles north of Balikpapan, Kalimantan/SBM about 4 miles offshore

Crude

Gravity, °API: 42.3
Vis., cSt @ 70° F.: 1.7
Pour pt, °F.: -10
Rvp @ 100° F., psi: 6.8
Total acid no., Mg KOH/g: 0.20
Sulfur, wt %: 0.09
Wax, wt %: 4.22
Con. carbon residue, wt %: 0.34
Charac. factor, K UOP: 11.5

Naphtha

Range, °C.: C₅-100
Yield, vol %: 15.3
RON, clear: 74.9

Naphtha

Range, °C.: 100-150
Yield, vol %: 17.6
Paraffins, vol %: 41
Naphthenes, vol %: 35
Aromatics, vol %: 24.7

Kerosine

Range, °C.: 150-250
Yield, vol %: 29.6
Smoke pt, mm: 16
Freezing pt, °C.: -54

Gas oil

Range, °C.: 250-350
Yield, vol %: 25
Diesel index: 51
Cetane no.: 52.6

Fuel oil

Range, °C.: 350 +
Yield, vol %: 12.5
Sulfur, wt %: 0.11
Pour pt, °F.: 100

Note: Attaka is mixed with Badak crude and other streams and shipped with Attaka specifications

Badak, Indonesia

Santan terminal about 80 miles north of Balikpapan, Kalimantan/SBM some 4 miles offshore

Crude

Gravity, °API: 41.3
Vis., cSt @ 100° F.: 5.72
Pour pt., °F.: -15
Rvp @ 100° F., psi: 5.6
Total acid number, mg KOH/g: 0.11
Sulfur, wt %: 0.08
Wax, wt %: 7.35
Con. carbon, wt %: 0.313
Charac. factor, K UOP: 12.5
Note: Badak is mixed with Attaka crude and shipped with Attaka specifications

Bekapai, Indonesia

Senipah marine terminal about 27 miles northeast of Balikpapan, Kalimantan/SBM about 6 miles offshore

Crude

Gravity, °API: 40
Sulfur, wt %: 0.08
Pour pt., °C.: -21
Rvp, psi: 1.9
Vis., cSt @ 37.8° C.: 2.02
Con. carbon, wt %: 0.25
Asphaltenes, wt %: <0.05
V/Ni, ppm: <0.5<0.5
Yield C₄ & lighter, wt %: 0.51

Gasoline

Range, °C.: C₅-100
Yield, wt %: 8.17
Gravity, °API: 63.6
Sulfur, ppm: <1
Paraffins, vol %: 45.8
Naphthenes, vol %: 47.6
Aromatics, vol %: 6.6
RON, clear: 73.8
RON + 0.6 g TEL: 88.5

Naphtha

Range, °C.: 100-185
Yield, wt %: 25.12
Gravity, °API: 49.1
Sulfur, ppm: 68
P/N/A, vol %: 33.2/48.9/17.9

Kerosine

Range, °C.: 185-230
Yield, wt %: 15.98
Gravity, °API: 42.5
Sulfur, wt %: 0.038
Aromatics, vol %: 18
Smoke pt., mm: 22
Freezing pt., °C.: -50.5

Gas oil

Range, °C.: 185-375
Yield, wt %: 52.06
Gravity, °API: 37.5
Sulfur, wt %: 0.083
Vis., cSt @ 37.8° C.: 2.62
Aniline pt., °C.: 67.6
Pour pt., °C.: -21

Residue

Range, °C.: 375+
Yield, wt %: 14.14
Gravity, °API: 18.9
Sulfur, wt %: 0.22

Vis., cSt @ 50° C.: 835
Pour pt., °C.: >+45
Con. carbon, wt %: 1.7
V/Ni, ppm: <2/2

Bekok, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia as part of Tapis Blend

Crude

Gravity, °API: 49.07
Vis., cSt @ 100° F.: 1.74
Pour pt., °F.: 26
Sulfur, ppm: 210
Total nitrogen, wt %: 0.0136
Neutralization no., mg KOH/g: 0.035
Rvp, psi: 7.6
Con. carbon residue, wt %: 0.22
V/Ni, ppm: <1/<1
Wax, wt %: 6.05
Yield, C₄ & lighter: 2.7

Light naphtha

Range, °F.: C₅-145
Yield (VT), vol %: 7.05
RON, clear: 72

Heavy naphtha

Range, °F.: 145-330
Yield, vol %: 26.76
Sulfur, ppm: 5
Total nitrogen, ppm: 0.7
RON, clear: 45
Paraffins, wt %: 57.40
Naphthenes, wt %: 29.27
Aromatics, wt %: 13.33

Kerosine

Range, °F.: 330-450
Yield, vol %: 15.74
Sulfur, ppm: 20
Freezing pt., °F.: -45
Cloud pt., °F.: -47
Smoke pt., mm: 20
Cetane index: 57.33
Diesel index: 76.48
Vis., cSt @ 70° F.: 1.64

Distillate

Range, °F.: 450-650
Yield, vol %: 26.13
Gravity, °API: 41.65
Sulfur, ppm: 220
Cetane index: 64.34
Diesel index: 74.34
Aniline pt., °C.: 81.5
Vis., cSt @ 70° F.: 5.15

Heavy gas oil

Range, °F.: 680-975
Yield, vol %: 15.85
Gravity, °API: 32.84
Sulfur, ppm: 600
Total nitrogen, ppm: 533
Pour pt., °F.: 113
Con. carbon residue, wt %: 0.059
Sodium, ppm: 13.84
V/Ni, ppm: 0.008/<0.01
Vis., cSt @ 130° F.: 11.32

Atmospheric residue

Range, °F.: 650+
Yield, vol %: 21.62
Gravity, °API: 31.54
Sulfur, ppm: 700
Pour pt., °F.: 113
Con. carbon residue, wt %: 1.986
Sodium, ppm: 0.125

V/Ni, ppm: <0.002/<0.01
Vis., cSt @ 130° F.: 27.37

Note: Bekok is contributor to Tapis blend

Bintulu, Malaysia

Bintulu SBM terminal off Sarawak

Crude

Gravity, °API: 26.5
Vapor pressure, Kg/sq cm: 0.21
Pour pt., °C.: -5.0
Vis., cSt @ 56° C.: 4.54
Carbon residue, wt %: 1.69
Sulfur, wt %: 0.13
Acid no. KOH mg/g: 0.43
Nitrogen, ppm: 450
Distillation, °C.:
Ibp-28
5%-104
10%-135
15%-169
20%-199
25%-227
30%-245
35%-259
40%-273
45%-285
47%-290

Note: Bintulu comes solely from Temana field offshore Sarawak

Bunyu, Indonesia

Bunyu Island terminal off east coast of Kalimantan/Four point CBM

Crude

Gravity, °API: 31.7
Vis., cSt @ 100° F.: 2.67
Pour pt., °F.: 60
Rvp @ 100° F., psi: 1.0
Sulfur, wt %: 0.09
Wax, wt %: 8.3
Con. carbon residue, wt %: 0.39
Charac. factor, K UOP: 11.4

Gasoline

Range, °C.: C₅-175
Yield, vol %: 18.5
RON, clear: 74.9

Kerosine

Range, °C.: 175-300
Yield, vol %: 49.0
Smoke pt., mm: 10

Gas oil

Range, °C.: 300-350
Yield, vol %: 13.0-
Diesel index: 41

Residue

Range, °C.: 350+
Yield, vol %: 19.5
Sulfur, wt %: 0.20
Pour pt., °F.: 115

Note: In late 1982 there were plans to mix Bunyu with Sembakung crude (37 °API). This assay of sample that did not contain Sembakung.

Champion Export, Brunel

Seria SBM

Crude

Gravity, °API: 23.9
Vis. @ 10° C., sq mm/sec: 21.1
Sulfur, wt %: 0.12
Wax, wt %: 0.4
Pour pt., °C.: < -36
Total acid no., mg KOH/g: 0.50
UOP K factor: 11.2
Yield light hydrocarbons, wt %: 0.70

Gasoline

Range, °C.: C₅-65
Yield, vol %: 0.4
Rvp, kPa: 70

Naphtha

Range, °C.: 65-100
Yield, vol %: 2.0
Sulfur, mg/kg: 24
RON, clear: 77
RON + 0.5 g Pb/l (TEL): 88

Naphtha

Range, °C.: 100-150
Yield, vol %: 4.5
Sulfur, mg/kg: 74
RON, clear: 71
Paraffins, wt %: 20
Naphthenes, wt %: 69
Aromatics, wt %: 11

Naphtha

Range, °C.: 150-200
Yield, vol %: 8.1
Density @ 15° C., kg/l: 0.827
Sulfur, mg/kg: 251
P/N/A, wt %: 15/69/16
Smoke pt, mm: 22

Kerosine

Range, °C.: 200-250
Yield, vol %: 16.2
Density @ 15° C.: 0.870
Sulfur, wt %: 0.06
Cloud pt, °C.: < -60
Smoke pt, mm: 18
Aniline pt, °C.: 46.9
Cetane no.: 31

Gas oil

Range, °C.: 250-300
Yield, vol %: 22.6
Density @ 15° C., kg/l: 0.899
Vis. @ 40° C., sq mm/sec: 3.84
Pour pt, °C.: -57
Aromatics, wt %: 36
Smoke pt, mm: 15
Cetane no.: 29

Gas oil

Range, °C.: 300-350
Yield, vol %: 15.2
Density @ 15° C., kg/l: 0.930
Vis. @ 40° C., sq mm/sec: 10.2
Sulfur, wt %: 0.17

Heavy gas oil

Range, °C.: 350-370
Yield, vol %: 4.3
Density @ 15° C., kg/l: 0.951
Pour pt, °C.: -6
Total nitrogen, mg/kg: 194

Residue

Range, °C.: 370+
Yield, vol %: 26.4

Density @ 15° C.: kg/l: 0.991
Vis. @ 60° C., sq mm/sec: 912
Sulfur, wt %: 0.25
Pour pt, °C.: 21
V/Ni, mg/kg: <1/3

Note: Assay sample contained 67 vol %
Champion crude, 18 vol % Magpie, and 15 vol %
Seria Land Heavy.

Cinta, Indonesia

SBM and floating storage barge in Java Sea producing area

Crude

Gravity, °API: 33.4
Sulfur, wt %: 0.075
Pour pt, °F.: 105
Vis., cSt @ 100° F.: 64.34
Rvp, lb: 1.4
V/Ni, ppm: 0.1/9.5
Wax content, wt %: 30.3
C₅ & lighter, vol %: 3.143

Light naphtha

Range, °F.: C₅-180
Yield, vol %: 1.89
Sulfur, ppm: 2.3
RON, clear: 61.0
RON + 3 ml TEL/gal: 84.8

Naphtha

Range, °F.: 180-300
Yield, vol %: 4.84
Sulfur, ppm: 5.1
RON, clear: 48.4
RON + 3 ml TEL/gal: 74.4
Paraffins, vol %: 55.2
Olefins, vol %: 0.9
Naphthenes, vol %: 39.0
Aromatics, vol %: 4.9

Heavy naphtha

Range, °F.: 300-380
Yield, vol %: 4.02
Gravity, °API: 53.3
Sulfur, ppm: 12.0
P/O/N/A, vol %: 67.6/17.22/6.8/1

Kerosine

Range, °F.: 380-450
Yield, vol %: 2.04
Gravity, °API: 48.6
Sulfur, ppm: 91.4
Smoke pt, mm: 34
Pour pt, °F.: -30
Aniline pt, °F.: 156.7
Aromatics (FIA), %: 8.4
Cetane no.: 46.5
Diesel index: 76.2

Gas oil

Range, °F.: 450-650
Yield, vol %: 11.99
Gravity, °API: 42.2
Sulfur, wt %: 0.04
Cetane number: 58.5
Pour pt, °F.: 15
Vis., cSt @ 100° F.: 2.74

Heavy gas oil

Range, °F.: 650-1,050
Yield, vol %: 40.06
Gravity, °F.: 34.7
Sulfur, wt %: 0.065
Con. carbon, wt %: 0.07
Total nitrogen, wt %: 0.15
Basic nitrogen, wt %: 0.009
V/Ni, ppm: 0.1/0.1
Pour pt, °F.: 115
Aromatics (FIA), %: 15.6
Vis., cSt @ 130° F.: 10.0

Residue

Range, °F.: 650+
Yield, vol %: 74.3
Gravity, °API: 27.6
Sulfur, wt %: 0.09
Con. carbon, wt %: 6.05
V/Ni, ppm: 0.1/2.3
Pour pt, °F.: >120
Total nitrogen, wt %: 0.25
Vis., cSt @ 130° F.: 123.7

Daqing, China (see Taching)

Duri (Sumatran Heavy), Sumatra, Indonesia

Port of Dumai, Sumatra

Crude

Gravity, °API: 21.1
Sulfur, wt %: 0.20
Vis., cSt @ 122° F.: 131.9
Pour pt, °F.: 54
C₅ & lighter, vol %: 0.02

Light naphtha

Range (TBP), °F.: C₅-200
Yield, vol %: 0.48
Gravity, °API: 70.7
Sulfur, wt %: 0.007
Paraffins, vol %: 66.1
Naphtha, vol %: 33.5
Aromatics, vol %: 0.4

Heavy naphtha

Range (TBP), °F.: 200-340
Yield, vol %: 3.2
Gravity, °API: 51.1
Sulfur, wt %: 0.009
P/N/A, vol %: 31/62/7

Kerosine

Range (TBP), °F.: 340-460
Yield, vol %: 6.0
Gravity, °API: 36.3
Sulfur, wt %: 0.039
Smoke pt, mm: 18
Freeze pt, °F.: -73

Gas oil

Range (TBP), °F.: 460-650
Yield, vol %: 14.7
Gravity, °API: 27.4
Sulfur, vol %: 0.136
Pour pt, °F.: -1
Diesel index: 37.9

Reduced crude

Range (TBP), °F.: 650+
Yield, vol %: 75.6
Gravity, °API: 17.6
Sulfur, wt %: 0.21
Pour pt, °F.: 86
Vis., cSt @ 122° F.: 1,134
Rams. carbon, wt %: 7.8
V/Ni/Fe, wt % ppm: 1/16/0

Handil, Kalimantan, Indonesia

SBM about 6 miles offshore 27 miles northeast of Balikpapan

Crude

Gravity, °API: 32.75
Sulfur, wt %: 0.079
Pour pt, °F.: +85
Rvp, psi: 1.6
Vis., cSt @ 37.8° C.: 4.2
Con. carbon, wt %: 1
V/Ni, ppm: <0.5/<1
C₅ & lighter, wt %: 0.5

Gasoline

Range, °C: C₅-75
Yield, wt %: 2.2
Gravity, °API: 69.4
Sulfur, ppm: 5
Paraffins, vol %: 64
Naphthenes, vol %: 20.2
Aromatics, vol %: 15.8
RON, clear: 79.7
RON + 0.6 g TEL/l: 89.2

Naphtha

Range, °C: 75-145
Yield, wt %: 11.4
Gravity, °API: 45.8
Sulfur, ppm: 9
P/N/A, vol %: 21.8/33.3/44.9

Kerosine

Range, °C: 145-250
Yield, wt %: 19.3
Gravity, °API: 33.6
Sulfur, ppm: 136
Aromatics (FIA), vol %: 44.2
Smoke pt, mm: 9
Freezing pt, °C: -49

Gas oil

Range, °C: 145-350
Yield, wt %: 46.3
Gravity, °API: 31.6
Sulfur, wt %: 0.061
Vis., cSt @ 20° C: 2.49
Aniline pt, °C: 51.8
Pour pt, °C: -7

Residue

Range, °C: 350+
Yield, wt %: 39.6
Gravity, °API: 25.1
Sulfur, wt %: 0.13
Vis., cSt @ 50° C: 46.7
Pour pt, °C: +45
Con. carbon, wt %: 2.6
V/Ni, ppm: <1/2

Jatibarang, Java, Indonesia

SBM terminal about 6.5 nautical miles off north coast of Java

Crude

Gravity, °API: 29.0
Vis., cSt @ 122° F: 83.8
Pour pt, °F: 110
Rvp @ 100° F, psi: 0.2
Sulfur content, wt %: 0.07
Wax content, wt %: 24.6
Con. carbon residue, wt %: 7.53
Charac. factor, K UOP: 12.5

Gasoline

Range, °C: 100-100
Yield, vol %: 3.6
RON, clear: 70.0

Naphtha

Range, °C: 100-175
Yield, vol %: 7.9
Paraffins, vol %: 46.0
Naphthenes, vol %: 43.0
Aromatics, vol %: 11.0

Kerosine

Range, °C: 175-250
Yield, vol %: 7.0
Smoke pt, mm: 21.0

Gas oil

Range, °C: 250-350
Yield, vol %: 13.1
Diesel index: 67.5

Residue

Range, °C: 350+
Yield, vol %: 68.4
Sulfur, wt %: 11.0
Pour pt, °F: 120

Labuan Blend, Sabah, Malaysia

SBM in South China Sea off Labuan Island terminal

Crude

Gravity, °API: 33.2
Vis., cSt @ 70° F: 4.41
Pour pt, °F: 52
Sulfur, ppm: 917
Neut. no., mg KOH/g: 0.30
Rvp, psi: 3.52
Con. carbon residue, wt %: 2.54
V/Ni, ppm: 0.015/0.002
Wax content, wt %: 2.34
Asphaltene content, wt %: 0.22
C₅ & lighter, wt %: 1.3

Light naphtha

Range, °F: C₅-145
Yield, vol %: 2.0
Sulfur, ppm: <5
Rvp, psi: 12.4

Heavy naphtha

Range, °F: 145-330
Yield, vol %: 18.80
Sulfur, ppm: 20
RON, clear: 67.0
RON + 3 cc TEL/U.S. gal: 85.0
Paraffins, wt %: 17.52
Naphthenes, wt %: 74.58
Aromatics, wt %: 7.89

Kerosine

Range, °F: 330-450
Yield, vol %: 18.00
Gravity, °API: 38.70
Sulfur, ppm: 140
Freezing pt, °F: -81.4
Pour pt, °F: <-17
Smoke pt, mm: 21
Cetane index: 34.39
Diesel index: 44

Distillate

Range, °F: 450-650
Yield, vol %: 38.27
Gravity, °API: 29.27
Sulfur, wt %: 0.07
Cloud pt, °F: 19.4
Cetane index: 40.09
Diesel index: 38
Aniline pt, °C: 55
Con. carbon residue, wt %: nil
Vis., cSt @ 70° F: 6.43

Residue

Range, °F: 650+
Yield, vol %: 21.96
Sulfur, wt %: 0.15
Nitrogen, ppm: 531
Pour pt, °F: 89.6
Con. carbon residue, wt %: 1.62
V/Ni, ppm: 0.03/0.08
Vis., cSt @ 100° F: 125.8

Heavy gas oil

Range, °F: 680-975
Yield, vol %: 16.83
Gravity, °API: 15.79
Sulfur, wt %: 0.14
Total nitrogen, ppm: 586
Basic nitrogen, ppm: 144
Pour pt, °F: 98+
Con. carbon residue, wt %: 0.30
Vis., cSt @ 100° F: 173.61

Note: Labuan Blend comes from offshore fields connected to North Sabah Trunk Line. They include Samarang and South Furious. Erb West, St. Joseph and Barton were to be added during late 1983.

Minas (Sumatran Light), Sumatra, Indonesia

Port of Dumai, Sumatra

Crude

Gravity, °API: 34.5
Sulfur, wt %: 0.081
Vis., cSt @ 122° F: 12.4
Pour pt, °F: 97
C₄ & lighter, vol %: 0.27

Light naphtha

Range (TBP), °F: C₅-200
Yield, vol %: 2.83
Gravity, °API: 80.0
Sulfur, wt %: 0.001
Paraffins, vol %: 75
Naphtha, vol %: 25
Aromatics, vol %: nil

Heavy naphtha

Range (TBP), °F: 200-340
Yield, vol %: 9.4
Gravity, °API: 60.2
Sulfur, wt %: 0.002
P.N.A., vol %: 62/30/8

Kerosine

Range (TBP), °F: 340-460
Yield, vol %: 10.5
Gravity, °API: 47.2
Sulfur, wt %: 0.015
Smoke pt, mm: 35
Freeze pt, °F: -34

Gas oil

Range (TBP), °F: 460-650
Yield, vol %: 20.2
Gravity, °API: 39.6
Sulfur, wt %: 0.061
Pour pt, °F: 44
Diesel index: 72

Reduced crude

Range (TBP), °F: 650+
Yield, vol %: 56.8
Gravity, °API: 26.5
Sulfur, wt %: 0.15
Pour pt, °F: 106
Vis., cSt @ 122° F: 101.2
Rams. carbon, wt %: 5.1
V/Ni/Fe, wt % ppm: 1/15/10

Miri Light, Sarawak, Malaysia

SBMs off Miri terminal

Crude

Gravity, °API: 36.27
Vis., cSt @ 70° F: 3.65
Pour pt, °F: 34
Sulfur, ppm: 825
Total nitrogen, wt %: 0.0137
Neut. no., mg KOH/g: 0.175
Rvp, psi: 4.7
Con. carbon residue, wt %: 2.94
V/Ni, ppm: 0.012/0.002
Wax content, wt %: 2.83
Asphaltene content, wt %: 0.258
C₅ & lighter, wt %: 2.2

Light naphtha
Range, °F.: C₅-145
Yield, vol %: 1.60
Sulfur, ppm: <5
Rvp, psi: 10.5

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 23.10
Sulfur, ppm: 17
RON, clear: 66.5
RON + 3 cc TEL/U.S. gal: 84.5
Paraffins, wt %: 14.55
Naphthenes, wt %: 68.94
Aromatics, wt %: 16.51

Kerosine
Range, °F.: 330-450
Yield, vol %: 15.80
Sulfur, ppm: 125
Freezing pt, °F.: < -70
Gravity, °API: 40.65
Smoke pt, mm: 21
Cetane index: 35.3
Diesel index: 47

Light distillate
Range, °F.: 450-650
Yield, vol %: 33.09
Gravity, °API: 30.99
Sulfur, ppm: 600
Cetane index: 41.1
Diesel index: 43
Aniline pt, °C.: 60
Vis., cSt @ 100° F.: 6.23

Residue
Range, °F.: 650 +
Yield, vol %: 25.26
Gravity, °API: 21.01
Sulfur, wt %: 0.17
Pour pt, °F.: 100.4
Con. carbon residue, wt %: 2.22
V/Ni, ppm: 0.030 < 0.001
Vis., cSt @ 100° F.: 217.26

Heavy gas oil
Range, °F.: 680-975
Yield, vol %: 20.26
Gravity, °API: 20.71
Sulfur, ppm: 0.15
Total nitrogen, ppm: 584
Basic nitrogen, ppm: 95
Pour pt, °F.: 35
Vis., cSt @ 100° F.: 103.85

Note: Miri is blend of 7 offshore fields. Miri Land crude no longer produced.

Pulai, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia, as part of Tapis Blend.

Crude
Gravity, °API: 42.52
Vis., cSt @ 70° F.: 2.12
Pour pt, °F.: 23
Sulfur, ppm: 160
Total nitrogen, ppm: 33.5
Rvp, psi: 2.7
Con. carbon residue, wt %: 0.11
V/Ni, ppm: 1.401
Wax content, wt %: 3.11
Asphaltene content, wt %: 0.31
C₄ & lighter, vol %: 0.45

Light naphtha
Range, °F.: C₅-145
Yield, vol %: 2.03
Sulfur, ppm: <5

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 27.93
Sulfur, ppm: <5
RON, clear: <70
Paraffins, wt %: 31.83
Naphthenes, wt %: 26.44
Aromatics, wt %: 31.38

Kerosine
Range, °F.: 330-450
Yield, vol %: 27.85
Sulfur, ppm: 19
Freezing pt, °F.: -67
Pour pt, °F.: -66
Smoke pt, mm: 21
Cetane index: 43.17
Diesel index: 56.62
Vis., cSt @ 70° F.: 1.71

Light distillate
Range, °F.: 450-650
Yield, vol %: 34.14
Gravity, °API: 34.8
Sulfur, ppm: 270
Cloud pt, °F.: +14
Cetane index: 48.63
Diesel index: 54.04
Aniline pt, °C.: 68.5
Vis., cSt @ 70° F.: 5.01

Residue
Range, °F.: 650 +
Yield, vol %: 7.60
Gravity, °API: 28.20
Sulfur, ppm: 800
Nitrogen, ppm: 323
Pour pt, °F.: 102
Aniline pt, °C.: 91
Con. carbon residue, wt %: 1.58
V/Ni, ppm: <0.01 < 0.01
Vis., cSt @ 130° F.: 17.53
Note: Pulau is contributor to Tapis Blend

Salawati, West Irian, Indonesia

Salawati marine terminal (breasting and mooring dolphins and storage barge) on Sele Strait

Crude
Gravity, °API: 38.0
Vis., cSt @ 100° F.: 4.2
Pour pt, °F.: -15
Rvp @ 100° F., psi: 0.6
Sulfur, wt %: 0.49
Wax content, wt %: 8.42
Con. carbon residue, wt %: 1.3
Charac. factor K UOP: 12.0

Gasoline
Range, °C.: C₄-94
Yield, vol %: 1.0

Naphtha
Range, °C.: 94-149
Yield, vol %: 10.7
Paraffins, vol %: 71.4
Naphthenes, vol %: 27.9
Aromatics, vol %: 0.8

Kerosine
Range, °C.: 149-260
Yield, vol %: 35.4
Smoke pt, mm: 35.5
Freezing pt, °F.: -28

Gas oil
Range, °C.: 260-344
Yield, vol %: 21.5
Cetane index: 58.6

Residue
Range, °C.: 344 +
Yield, vol %: 31.4
Sulfur, wt %: 1.1
Pour pt, °F.: 115

Sanga Sanga, Kalimantan, Indonesia

Crude
Gravity, °API: 25.7
Rvp, psi @ 100° F.: 0.8
Sulfur, wt %: 0.17
Pour pt, °F.: +5
V/Ni, ppm: nil/0.9
Vis., SUS @ 100° F.: 151.3
Con. carbon residue, wt %: 0.79

Naphtha
Range, °F.: 1bp-350
Yield, vol %: 13.2
Rvp, psi @ 100° F.: 2.7
Sulfur, wt %: 0.015

Kerosine
Range, °F.: 350-450
Yield, vol %: 12.4
Aniline pt, °C.: 118
Sulfur, wt %: 0.04
Smoke pt, mm: 16

Diesel
Range, °F.: 450-650
Yield, vol %: 41.6
Gravity, °API: 25.3
Aniline pt, °C.: 133
Cetane index (calc.): 36.5
Sulfur, wt %: 0.13
Pour pt, °F.: +25
Vis., SUS @ 100° F.: 41.6

Fuel oil
Range, °F.: 650 +
Yield, vol %: 32.8
Gravity, °API: 19.3
Sulfur, wt %: 0.31
Pour pt, °F.: +105
V/Ni, ppm: Nil/1.4

Sepinggagan-Yakin Mixed (4:1), East Kalimantan, Indonesia

Lawi-Lawi terminal about 12 miles south of Balikpapan/SBM about 6 miles offshore in Makasar Straits

Crude
Gravity, °API: 31.7
Vis., cSt @ 100° F.: 3.16
Pour pt, °F.: 20
Rvp, psi @ 100° F.: 2.6
Total acid no., mg KOH/g: 0.3
Sulfur content, wt %: 0.11
Con. carbon residue, wt %: 0.54

Gasoline
Range, °C.: C₄-100
Yield, vol %: 1.5

Naphtha
Range, °C.: 100-175
Yield, vol %: 19.5

Kerosine
Range, °C.: 175-250
Yield, vol %: 21.5

Gas oil
Range, °C.: 250-350
Yield, vol %: 35.5

Fuel oil
Range, °C.: 350 +
Yield, vol %: 22.0

Seria Light, Brunei

Lutong terminal

Crude
Gravity, °API: 36.2
Rvp, psi: 6.0
Sulfur, wt %: 0.07
Pour pt, °F.: 35
Vis., SSU @ 80° F.: 36.5
Yield, lbp-113° F., vol %: 5.77

Gasoline
Range, °F.: 113-220
Yield, vol %: 10.23
RON + 3 cc TEL/gal: 85.0

Naphtha
Range, °F.: 220-390
Yield, vol %: 21.41
Paraffins, vol %: 35.9
Naphthenes, vol %: 34.6
Dinaphthenes, vol %: 11.8
Aromatics, vol %: 17.7

Light distillate
Range, °F.: 390-550
Yield, vol %: 26.63
Gravity, °API: 33.0
Cetane index: 35.0
Sulfur, wt %: 0.04
Aniline pt, °F.: 129.5
Pour pt, °F.: -35
Range, °F.: 550-650
Yield, vol %: 13.88
Gravity, °API: 29.0

Light gas oil
Range, °F.: 450-650
Yield, vol %: 31.74
Gravity, °API: 30.1
Cetane index: 40.7
Sulfur, wt %: 0.07

Heavy gas oil
Range, °F.: 650-971
Yield, vol %: 18.89
Gravity, °API: 18.0
Sulfur, wt %: 0.15
Total nitrogen, ppm: 513
Basic nitrogen, ppm: 262
Pour pt, °F.: 95
Carbon residue, wt %: 0.18

Vacuum flashed residue
Range, °F.: 971 +
Yield, vol %: 3.19
Gravity, °API: 10.0
Sulfur, wt %: 0.32

Shengli, China

Qingdao terminal on Yellow Sea

Crude
Gravity, °API: 24.2
Rvp, psi: 0
Sulfur, wt %: 1.00
Pour pt, °F.: +70
Vis., SFS @ 122° F.: 48.3
Acid no.: 1.16

Light ends
Range, °F.: lbp-160
Yield, vol %: 2.0

Light naphtha
Range, °F.: 160-290
Yield, vol %: 3.3
Paraffins, vol %: 45.9
Naphthenes, vol %: 44.7
Aromatics, vol %: 9.4

Heavy naphtha
Range, °F.: 290-390
Yield, vol %: 3.7
Gravity, °API: 47.5
Sulfur, wt %: 0.05
P/N/A, vol %: 48.9/30.9/20.2

Kerosine
Range, °F.: 390-500
Yield, vol %: 6.2
Gravity, °API: 39.9
Sulfur, wt %: 0.23
Olefins, vol %: 0.9
Aromatics, vol %: 16.5
Smoke pt, mm: 17
Freeze pt, °F.: -29.2

Diesel
Range, °F.: 500-660
Yield, vol %: 12.3
Gravity, °API: 34.7
Sulfur, wt %: 0.53
Pour pt, °F.: +40
Cetane index: 52.6
Cloud pt, °F.: +42

Light gas oil
Range, °F.: 660-780
Yield, vol %: 9.7
Gravity, °API: 31.4
Sulfur, wt %: 0.65
Vis., SSU @ 100° F.: 76.0
Pour pt, °F.: +80
Aniline pt, °F.: 183.0
UOP K factor: 12.1
Carbon residue, wt %: 0.06

Heavy gas oil
Range, °F.: 780-1,050
Yield, vol %: 26.4
Gravity, °API: 24.8
Sulfur, wt %: 0.79
Vis., SSU @ 210° F.: 78.3
Pour pt, °F.: +110
Aniline pt, °F.: 202.0
Carbon residue, wt %: 0.28

Bottoms
Range, °F.: 1,050 +
Yield, vol %: 36.4
Gravity, °API: 11.7
Sulfur, wt %: 1.66
Vis., SFS @ 210° F.: 1,097.8
Carbon residue, wt %: 16.4

Soviet Export Blend, U.S.S.R.

Terminals: Ventspils, Baltic and Novorossysk, Black Sea

Crude
Gravity, °API: 32.5
Sulfur, wt %: 1.38
Rvp, kPa: 49.2
Pour pt, °C.: -23
Vis. @ 20° C.: 11.5

Light naphtha
Range (TBP), °C.: lbp-90
Yield, wt %: 10.3
Density @ 15° C., g/ml: 0.676
Sulfur, wt %: 0.005

Paraffins, wt %: 71.7
Naphthenes, wt %: 26.5
Aromatics, wt %: 1.8

Heavy naphtha
Range (TBP), °C.: 90-180
Yield, wt %: 11.3
Density @ 15° C., g/ml: 0.761
Sulfur, wt %: 0.029
P/N/A, vol %: 38.5/52.0/9.5

Kerosine
Range (TBP), °C.: 180-220
Yield, wt %: 6.5
Density @ 15° C., g/ml: 0.806
Sulfur, wt %: 0.15
Aromatics, vol %: 20.1
Freeze pt, °C.: -57
Smoke pt, mm: 25
Aniline pt, °C.: 62.5
Vis., cSt @ 20° C.: 1.73

Light gas oil
Range (TBP), °C.: 180-350
Yield, wt %: 24.3
Density @ 15° C., g/ml: 0.840
Cetane index (calc.): 49.5
Sulfur, wt %: 0.57
Pour pt, °C.: -29
Aniline pt, °C.: 67.5
Vis., cSt @ 20° C.: 3.69

Heavy gas oil
Range (TBP), °C.: 350-515
Yield, wt %: 29.4
Density @ 15° C., g/ml: 0.915
Sulfur, wt %: 1.9
Vis., cSt @ 50° C.: 26.0
V/Ni, ppm: 0.15/0.17

Long residuum
Range, °C.: 350
Yield, wt %: 54.1
Density @ 15° C., g/ml: 0.952
Sulfur, wt %: 2.59
Rams. carbon, wt %: 8.2
Vis., cSt @ 50° C.: 191

Short residuum
Range, °C.: 515
Yield, wt %: 26.4
Sulfur, wt %: 2.98
Rams. carbon, wt %: 16.4
Vis. @ 60° C.: 3.9
V/Ni, ppm: 154/53

Note: Crude on which this assay was based was shipped from Ventspils. It is claimed that crude from either port is of similar quality.

Taching (Daqing), China

Luda (Darien) terminal on Yellow Sea

Crude
Gravity, °API: 33.0
Sulfur, wt %: 0.78
Pour pt, °F.: +95

Light ends
Range, °F.: lbp-160
Yield, vol %: 1.8

Light naphtha
Range, °F.: 160-290
Yield, vol %: 5.4
Sulfur, wt %: 0.0130
Paraffins, vol %: 46.6
Olefins, vol %: 0.4
Naphthenes, vol %: 50.4
Aromatics, vol %: 2.6

Heavy naphtha
Range, °F.: 290-390
Yield, vol %: 5.8

Sulfur, wt %: 0.010
P/O/N/A, vol %: 39.6/1.5/52.4/6.5

Kerosine
Range, °F: 390-500
Yield, vol %: 7.7
Gravity, °API: 44.0
Sulfur, wt %: 0.0127
Olefins, vol %: 3.2
Aromatics, vol %: 11.1
Smoke pt, mm: 22
Freezing pt, °F: -13.9

Diesel
Range, °F: 500-635
Yield, vol %: 7.2
Gravity, °API: 39.2
Sulfur, wt %: 0.0390
Vis., SSU @ 100° F: 40.2
Pour pt, °F: +40
Aniline pt, °F: 178.0
Diesel index: 69.8

Light gas oil
Range, °F: 635-775
Yield, vol %: 16.3
Gravity, °API: 37.0
Sulfur, wt %: 0.0480
Vis., SSU @ 100° F: 52.1
Pour pt, °F: +80
Carbon residue, wt %: 0.01

Heavy gas oil
Range, °F: 775-932
Yield, vol %: 18.9
Gravity, °API: 31.4
Sulfur, wt %: 0.1140
Vis., SSU @ 210° F: 48.1
Pour pt, °F: +115
UDF K factor: 12.5
Carbon residue, wt %: 0.03

Bottoms
Range, °F: 932+
Yield, vol %: 36.9
Gravity, °API: 21.2
Sulfur, wt %: 0.14
Vis., SSU @ 210° F: 52.2
Carbon residue, wt %: 7.3
V/Ni, ppm: 1.0/0

Tapis, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia, as part of Tapis Blend

Crude
Gravity, °API: 44.30
Vis., cSt @ 70° F: 2.69
Pour pt, °F: 39
Sulfur, ppm: 230
Total nitrogen, ppm: 134
Basic nitrogen, ppm: 10.1
Neut. no., mg KOH/g: 0.04
Rvp, psi: 2.5
Con. carbon residue, wt %: 2.17
V/Ni, ppm: <0.002/0.17
Wax content, wt %: 5.75
Asphaltene content, wt %: 0.112
Yield, C₄ & lighter, vol %: 0.97

Light gasoline
Range, °F: C₅-145
Yield, vol %: 2.97
Sulfur, ppm: <5
Rvp, psi: 10.4
RON, clear: 74
RON + 3 cc TEL/US gal: 92.5
Paraffins, wt %: 84.15

Naphthenes, wt %: 13.22
Aromatics, wt %: 2.63

Heavy naphtha
Range, °F: 145-330
Yield, vol %: 23.47
Sulfur, ppm: 13
RON, clear: 53
P/N/A, wt %: 40.26/31.08/28.66

Kerosine
Range, °F: 330-450
Yield, vol %: 20.70
Sulfur, ppm: 23
Freezing pt, °F: -40
Smoke pt, mm: 20
Cetane index: 55.87
Diesel index: 74

Light distillate
Range, °F: 450-650
Yield, vol %: 34.27
Gravity, °API: 41.0
Sulfur, ppm: 135
Cetane index: 61.9
Aniline pt, °C: 79.5
Vis., SUS @ 70° F: 41.35

Residue
Range, °F: 650+
Yield, vol %: 17.62
Gravity, °API: 29.58
Sulfur, ppm: 700
Pour pt, °F: 108
Con. carbon residue, wt %: 2.024
V/Ni, ppm: 0.31/0.01
Vis., SUS @ 130° F: 102.31

Note: Tapis is contributor to Tapis Blend

Tapis Blend, Malaysia

Piped ashore to terminal north of Chukar, Kuala Trengganu area, peninsular Malaysia

Tapis Blend comprises oil from six fields in the South China Sea. They are Tapis, Pulau, Bekok, Trong, Tingge, and Kepong. The latter three fields only recently began contributing to blend and assays had not yet been run at mid 1983. Tapis crude originally made up 60% of blend, Pulau and Bekok 40%. Assays are presented for these three crudes.

Tembungo, Sabah, Malaysia

Production platform in off-shore producing area

Crude
Gravity, °API: 37.4
Sulfur, wt %: 0.04
Pour pt, °F: +25
Vis., cSt @ 100° F: 2.0
Rvp, psi: 2.8
Salt content, lb/1,000 bbl: 2.3

Light naphtha
Range, °F: C₅-160
Yield, vol %: 2.4
Gravity, °API: 81.0
Sulfur, wt %: 0.001
Rvp, psi: 12.6
Paraffins, vol %: 83.0

Naphthenes, vol %: 17.0
Aromatics, vol %: Nil

Heavy naphtha
Range, °F: 160-300
Yield, vol %: 17.9
Gravity, °API: 53.0
Sulfur, wt %: 0.004
Paraffins, vol %: 27.0
Naphthenes, vol %: 59.0
Aromatics, vol %: 14.0

Light distillate
Range, °F: 300-510
Yield, vol %: 35.7
Gravity, °API: 36.0
Sulfur, wt %: 0.04
Freeze point, °F: -45 est.
Smoke pt, mm: 13.0
Paraffins, vol %: 30.0
Naphthenes, vol %: 36.0
Aromatics, vol %: 34.0

Heavy distillates
Range, °F: 510-650
Yield, vol %: 28.9
Gravity, °API: 33.0
Sulfur, wt %: 0.06
Pour pt, °F: +15.0
Aniline pt, °F: 153.0
Diesel index: 50.5

Resid
Range, °F: 650+
Yield, vol %: 13.5
Gravity, °API: 25.0
Sulfur, wt %: 0.14
Pour pt, °F: 85.0
Vis., cSt @ 100° F: 42.0
Con. carbon, wt %: 0.55

Udang, Natuna Sea, Indonesia

Storage vessel with SBM about 43 nautical miles north of Anambas Island

Crude
Gravity, °API: 38.0
Kin. vis. @ 130° F: 8.71
Con. carbon residue, wt %: 3.0
Sulfur, wt %: 0.05
V/Ni, ppm: 0.9/3.5
Pour pt, °C: +37.8
Rvp, psi: nil
C₄ & lighter, vol %: 0.36

Naphtha
Range (TBP), °F: 90-375
Yield, vol %: 15.2
Gravity, °API: 63.3
Paraffins, vol %: 75.5
Naphthenes, vol %: 20.3
Sulfur, wt %: <0.005

Kerosine
Range, °F: 375-520
Yield, vol %: 11.4
Gravity, °API: 47.7
Sulfur, wt %: 0.005
Aromatics, vol %: 6

Heavy distillate
Range, °F: 520-700
Yield, vol %: 18.7
Gravity, °API: 41.6
Sulfur, wt %: 0.02

Gas oil
Range, °F: 700-1,010
Yield, vol %: 34.6
Gravity, °API: 35.4
Sulfur, wt %: 0.04

Residue
Range, °F.: 1,010+
Yield, vol %: 19.7
Gravity, °API: 20.9
Sulfur, wt %: 0.10
Kin. vis. @ 210° F.: 150
Con. carbon residue, wt %: 12.2
V/Ni, ppm: 4/16

Walio, West Irian, Indonesia

Kasim marine terminal (CBM) between island of Jef Kasim and mainland Irian Jaya

Crude
Gravity, °API: 34.05
Vis., cSt @ 100° F.: 5.0
Rvp @ 100° C., psi: 3.7
Acid no., mg KOH/g: 0.30
Con. carbon residue, wt %: 2.18
Charac. factor K UOP: 11.7

Gasoline
Range, °C.: C₅-95
Yield, vol %: 4.5

Naphtha
Range, °C.: 95-185
Yield, vol %: 19.0
Paraffins, vol %: 63.3
Naphthenes, vol %: 30.7
Aromatics, vol %: 6.0

Kerosine
Range, °C.: 185-260
Yield, vol %: 16.7
Smoke pt, mm: 22.0
Freezing pt, °C.: -46

Gas oil
Range, °C.: 260-350
Yield, vol %: 20.0
Diesel index: 56.1

Fuel oil
Range, °C.: 350+
Yield, vol %: 39.8
Sulfur, wt %: 1.36
Pour pt, °F.: 100

Latin America

BCF 24, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 23.5
Sulfur, wt %: 1.85
Vis., SUS @ 100° F.: 192.2
Pour pt, °F.: -60
Yield, 0° (IVT) - -82° F., vol %: 1.53

Light naphtha
Range, °F.: 82-200
Yield, vol %: 3.80
Sulfur, wt %: 0.0011
Paraffins, %: 71.37
Naphthenes, %: 26.70
Aromatics, %: 1.93

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 5.0
Sp gr: 0.7565
Sulfur, wt %: 0.0066

P/N/A, %: 48.24/39.87/11.89
RON clear: 65.4

Naphtha
Range, °F.: 300-350
Yield, vol %: 2.82
P/N/A, %: 41.95/42.21/15.84

Kerosine
Range, °F.: 350-400
Yield, vol %: 3.14
P/N/A, %: 37.59/44.45/17.95
Sulfur, wt %: 0.1186
Freeze pt, °F.: -91.39
Smoke pt, mm: 22.25
Cetane no.: 46.06
Aniline pt, °F.: 128.05

Gas oil
Range, °F.: 400-500
Yield, vol %: 7.53
Gravity, °API: 37.37
Sulfur, wt %: 0.3027
Kin. vis. @ 122° F.: 1.51
Freeze pt, °F.: -63.27
Smoke pt, mm: 19.33
Aniline pt, °F.: 136.44
Cetane no.: 42.20

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.55

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.73
Sulfur, wt %: 1.06
Gravity, °API: 29.07
Kin. vis. @ 122° F.: 4.62
Pour pt, °F.: 4.13
Smoke pt, mm: 7.22
Aniline pt, °F.: 150.73

Residue
Range, °F.: 650+
Yield, vol %: 61.91
Gravity, °API: 13.26
Sulfur, wt %: 2.58
Kin. vis. @ 122° F.: 2,295
Ni/V, ppm: 40/347

Bachaquero, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 16.8
Sulfur, wt %: 2.4
Vis., SUS @ 100° F.: 1,362
Pour pt, °F.: -10
Rvp, psi: 1.6
Yield, 0° (IVT) - -82° F., vol %: 0.80

Light naphtha
Range, °F.: 82-200
Yield, vol %: 2.44
Sulfur, wt %: 0.0075
Paraffins, %: 66.17
Naphthenes, %: 31.28
Aromatics, %: 2.55
RON clear: 71.7

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 3.54
Sulfur, wt %: 0.026
P/N/A, wt %: 29.38/58.96/11.66
RON clear: 66.7

Naphtha
Range, °F.: 300-350
Yield, vol %: 1.81
Sp gr: 0.8018
Sulfur, wt %: 0.1107
P/N/A, %: 23.20/59.59/17.21

Kerosine
Range, °F.: 350-400
Yield, vol %: 2.11
Sp gr: 0.8227
Sulfur, wt %: 0.19
P/N/A, %: 25.12/54.49/20.39
Freeze pt, °F.: -74.12
Smoke pt, mm: 17.75
Cetane no.: 48.56

Gas oil
Range, °F.: 400-500
Yield, vol %: 6.37
Gravity, °API: 35.43
Sulfur, wt %: 0.52
Aromatics, wt %: 25.29
Freeze pt, °F.: -66.62
Smoke pt, mm: 9.23
Cetane no.: 46.36
Aniline pt., °F.: 127.39
Cetane index: 39.98

Gas oil
Range, °F.: 500-550
Yield, vol %: 3.93

Gas oil
Range, °F.: 550-650
Yield, vol %: 8.95
Sulfur, wt %: 1.36
Pour pt, °F.: -47.99
Smoke pt, mm: 2.83
Aniline pt, °F.: 138.64

Residue
Range, °F.: 650+
Yield, vol %: 70.24
Gravity, °API: 9.39
Sulfur, wt %: 3.0
Kin. vis. @ 122° F.: 8,672
Ni/V, ppm: 74/435

Boscan, Venezuela

Bajo Grande, Lake Maracaibo

Crude
Gravity, °API: 10.10
Sulfur, wt %: 5.5
Vis. SUS @ 100° F.: 90,000
Pour pt, °F.: +50

Light naphtha
Range, °F.: 82-200
Yield, vol %: 0.55

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 1.32
Sulfur, wt %: 0.68
Paraffins, %: 53.28

Naphtha
Range, °F.: 300-350
Yield, vol %: 0.88
Sulfur, wt %: 1.28
Paraffins, %: 34.9

Kerosine
Range, °F.: 350-400
Yield, vol %: 1.28
Sulfur, wt %: 1.88
Aromatics, %: 24.04
Pour pt, °F.: -141.0
Smoke pt, mm: 16.0
Aniline pt, °F.: 112.69

Gas oil
Range, °F.: 400-500
Yield, vol %: 3.96
Gravity, °API: 34.0
Sulfur, wt %: 3.14
Kin. vis. @ 122° F.: 1.81
Pour pt, °F.: -77.53
Smoke pt, °F.: 16.11

Aniline pt, °F.: 113.83
Cetane index: 37.24

Gas oil
Range, °F.: 500-550
Yield, vol %: 2.66
Gravity, °API: 28.62
Sulfur, wt %: 4.02

Gas oil
Range, °F.: 550-650
Yield, vol %: 6.46
Gravity, °API: 25.54
Sulfur, wt %: 4.47
Pour pt, °F.: -10.9
Cetane no.: 38.0
Aniline pt, °F.: 117.3
Cetane index: 42.27

Residue
Range, °F.: 650 +
Yield, vol %: 82.9
Sulfur, wt %: 5.86
Gravity, °API: 6.10
Sulfur, wt %: 5.86
Ni/V, ppm: 175/1,407
Kin. vis. @ 122° F.: 22,502

Ceuta, Venezuela

Puerto Miranda, Lake Maracaibo

Crude
Gravity, °API: 31.8
Sulfur, wt %: 1.2
Vis., SUS @ 100° F.: 62
Pour pt, °F.: -35
Rvp: 2.7
Yield, O₂(IVT) - -82° F., vol %: 2.10

Light naphtha
Range, °F.: 82-200
Yield, vol %: 7.51
Sulfur, wt %: 0.002
Paraffins, %: 75.69
Naphthenes, %: 19.85
Aromatics, %: 4.46
RON clear: 71.5

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 9.89
Sulfur, wt %: 0.01
P/N/A, %: 50.88/32.07/17.05
RON clear: 60.9

Naphtha
Range, °F.: 300-350
Yield, vol %: 5.36
P/N/A, %: 42.25/38.78/18.98

Kerosine
Range, °F.: 350-400
Yield, vol %: 5.28
Gravity, °API: 44.1
Sulfur, wt %: 0.054
P/N/A, %: 39.8/41.1/19.0
Smoke pt, mm: 21.39
Aniline pt, °F.: 122.8
Cetane index: 40.9

Gas oil
Range, °F.: 400-550
Yield, vol %: 9.93
Gravity, °API: 38.75
Sulfur, wt %: 0.33
Aromatics, %: 19.10
Smoke pt, mm: 19.59
Aniline pt, °F.: 136.18
Cetane index: 41.84

Gas oil
Range, °F.: 500-550
Yield, vol %: 5.0
Gravity, °API: 34.64
Sulfur, wt %: 0.72

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.24
Gravity, °API: 30.17
Sulfur, wt %: 1.0
Aniline pt, °F.: 155.8
Cetane index: 48.03

Residue
Range, °F.: 650 +
Yield, vol %: 45.69
Gravity, °API: 16.60
Sulfur, wt %: 2.05
Ni/V, ppm: 54/281

Galeota Mix (Trinidad Blend), Trinidad Tobago

Point Galeota SBM

Crude
Gravity, °API: 32.8
Sulfur, wt %: 0.27
Rvp, psi: 2.0
Pour pt, °F.: -5
Neut. no., mg KOH/g: 0.84
Rams. carbon, wt %: 0.5
Kin. vis., cSt @ 100° F.: 4.32
V/Ni, ppm: 0/1
Yield C₄ & lighter, vol %: 0.6

Naphtha
Range, °F.: C₅-200
Yield, vol %: 3.7
Sulfur, wt %: 0.010
Paraffins, vol %: 63.1
Naphthenes, vol %: 30.5
Aromatics, vol %: 6.4
RON clear: 73.1

Heavy naphtha
Range, °F.: 200-320
Yield, vol %: 8.7
Sulfur, wt %: 0.017
P/N/A, vol %: 39.4/44.9/15.7
RON clear: 63.8

Kerosine
Range, °F.: 320-520
Yield, vol %: 28.8
Gravity, °API: 36.6
Sulfur, wt %: 0.054
Aniline pt, °F.: 126.7
Diesel index: 46.3
Cetane index: 35.6
Freeze pt, °F.: -56
Smoke pt, mm: 20

Gas oil
Range, °F.: 520-650
Yield, vol %: 25.6
Gravity, °API: 30.3
Sulfur, wt %: 0.223
Aniline pt, °F.: 151.0
Diesel index: 45.8
Cetane index: 44.6
Pour pt, °F.: 11

Gas oil
Range, °F.: 650-850
Yield, vol %: 20.1
Gravity, °API: 26.6
Sulfur, wt %: 0.454
Nitrogen, wt %: 0.030
Vis., SUS @ 122° F.: 77.8

Residue
Range, °F.: 650 +
Yield, vol %: 32.8
Gravity, °API: 24.2
Sulfur, wt %: 0.607
Pour pt, °F.: +65
Nitrogen, wt %: 0.086
Rams. carbon, wt %: 1.35
Vis., SUS @ 122° F.: 200.3
V/Ni, ppm: 1/1

Isthmus, Mexico

Pajaritos, Veracruz, and Sali- na Cruz (Pacific), Oaxaca

Crude
Gravity, °API @ 60° F.: 32.8
Sulfur, wt %: 1.51
Pour test, °F.: -15
Vis., SUS @ 70° F.: 65.53
Vis., SUS @ 100° F.: 43.91
Rvp, psi @ 100° F.: 6.4
Hydrogen sulfide, ppm: 102
NC₄ & lighter, wt %: 1.2

Light straight run
Range, °F.: 60-200
Yield, vol %: 9.1
Total sulfur, wt %: 0.046
RON clear: 62.6
RON + 3 ml TEL/gal: 82.4

Naphtha
Range, °F.: 60-400
Yield, vol %: 29.9
Paraffins, vol %: 64.40
Naphthenes, vol %: 21.02
Aromatics, vol %: 14.58
Total sulfur, wt %: 0.054
RON clear: 44.5
RON + 3 ml TEL/gal: 67.0

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.5
Gravity, °API: 41.2
Freezing point, °F.: -36
P/N/A, vol %: 47.4/30.9/21.7
Total sulfur, wt %: 0.23
Aniline pt, °F.: 143.2
Smoke pt, mm: 22

Light gas oil
Range, °F.: 500-650
Yield, vol %: 16.0
Gravity, °API: 32.3
Pour pt, °F.: +25
P/N/A, vol %: 41.2/33.3/25.5
Total sulfur, wt %: 1.19
Carbon residue, Rams., wt %: 0.01
Aniline pt, °F.: 156.3
Cetane index: 52.5

Topped crude
Range, °F.: 650 +
Yield, vol %: 40.4
Gravity, °API: 15.5
Vis., SUS @ 210° F.: 145.47
Vis., SUS @ 122° F.: 149.53
Pour pt, °F.: +55
Total sulfur, wt %: 2.94
Carbon residue, Rams., wt %: 8.08
Nitrogen, %: 0.2065
Ni/V, ppm: 14.8/67.1

Vacuum gas oil
Range, °F.: 650-1,100 +
Yield, vol % (of crude): 28.5
Gravity, °API: 19.7
Aniline pt, °F.: 181.1
Vis., SUS @ 130° F.: 207.09
Pour pt, °F.: +110
Sulfur, wt %: 2.45
Carbon residue, Rams., wt %: 0.97
Ni/V, ppm: 4.3/-

Vacuum residue
Range, °F.: 1,100 +
Yield, vol % (of crude): 11.9
Gravity, °API: 4.2
Vis., SFS @ 275° F.: 235.8
Sulfur, wt %: 4.18
Carbon residue, wt %: 23.08
Ni/V, ppm: 37/210

Lagomedio, Venezuela

Punta Palmas, Puerto Miranda/La Salina, Lake Maracaibo

Crude

Gravity, °API: 31.50
Sulfur, wt %: 1.17
Vis., SUS @ 100° F.: 56
Pour pt., °F.: -15
Rvp: 5.3
Yield, O°(IVT) - 82° F., vol %: 1.96

Light naphtha

Range, °F.: 82-200
Yield, vol %: 6.10
Paraffins, %: 77.35
Naphthenes, %: 20.38
Aromatics, %: 2.28
RON clear: 65.6

Heavy naphtha

Range, °F.: 200-300
Yield, vol %: 9.27
Sulfur, wt %: 0.0
P/N/A, %: 55.4/33.0/11.5

Naphtha

Range, °F.: 300-350
Yield, vol %: 5.0
P/N/A, %: 50.0/32.5/17.5

Kerosine

Range, °F.: 350-400
Yield, vol %: 4.95
Sulfur, wt %: 0.027
Aromatics, %: 19.5
Smoke pt., mm: 24.5
Cetane no.: 56.12
Cetane index: 47.2

Gas oil

Range, °F.: 400-500
Yield, vol %: 9.39
Gravity, °API: 40.65
Sulfur, wt %: 0.17
Aromatics, %: 19.7
Smoke pt., mm: 20.61
Cetane no.: 50.02
Aniline pt., °F.: 147.34
Cetane index: 50.3

Gas oil

Range, °F.: 500-550
Yield, vol %: 4.69
Gravity, °API: 36.9
Sulfur, wt %: 0.44

Gas oil

Range, °F.: 550-650
Yield, vol %: 9.49
Gravity, °API: 33.4
Sulfur, wt %: 0.78
Cetane no.: 54.81
Aniline pt., °F.: 165.46
Cetane index: 58.1

Residue

Range, °F.: 650+
Yield, vol %: 49.15
Gravity, °API: 18.16
Sulfur, wt %: 1.97
Ni/V, ppm: 20/180

La Rosa Medium, Venezuela

La Salina, Lake Maracaibo

Crude

Gravity, °API: 25.3

Sulfur, wt %: 1.73
Pour pt., °F.: < -50
Rvp, psi: 4.0
Neut. no., mg KOH/g: 0.90
Vis. kin., cSt @ 122° F.: 24.0
Yield, C₅ & lighter: 1.34

Distillation °F.

	On crude	Yield, vol %:
C ₂ -C ₅	1.34	Cum.
158	2.47	1.34
212	2.33	3.80
302	5.40	6.13
401	6.69	11.52
509	7.81	18.21
650	13.22	26.01
698	5.63	39.23
752	6.33	44.85
752+	48.83	51.17
		100.00

Residue

Range, °F.: 752+
Yield, vol %: 48.83
Gravity, °API: 12.1
Sulfur, wt %: 2.63
Con. carbon, wt %: 12.85
V/Ni, ppm: 413/43
Kin. vis., cSt @ 140° F.: 2,397

Leona, Venezuela

Puerto La Cruz, State of Anzoategui

Crude

Gravity, °API: 24.1
Sulfur, wt %: 1.5
Vis., SUS @ 122° F.: 305
Pour pt., °F.: -45
Rvp: 5.5
Yield, O°(IVT)-82° F., vol %: 0.99

Naphtha

Range, °F.: 82-200
Yield, vol %: 4.34
RON clear: 63.9

Heavy naphtha

Range, °F.: 200-300
Yield, vol %: 6.71
Sulfur, wt %: 0.005
Paraffins, %: 49.85
Naphthenes, %: 32.13
Aromatics, %: 18.01

Naphtha

Range, °F.: 300-350
Yield, vol %: 3.34

Kerosine

Range, °F.: 350-400
Yield, vol %: 3.39
Sulfur, wt %: 0.05
P/N/A, %: 34.6/43.9/21.5
Smoke pt., mm: 18.15
Cetane no.: 44.78
Aniline pt., °F.: 135.13
Cetane index: 43.23

Gas oil

Range, °F.: 400-500
Yield, vol %: 10.51
Gravity, °API: 36.39
Sulfur, wt %: 0.19
Smoke pt., mm: 16.14
Cetane no.: 50.18
Aniline pt., °F.: 149.11
Cetane index: 46.50

Gas oil

Range, °F.: 500-550
Yield, vol %: 5.31
Sulfur, wt %: 0.56

Gas oil

Range, °F.: 550-650
Yield, vol %: 10.32
Gravity, °API: 28.46
Sulfur, wt %: 0.92
Pour pt., °F.: 17.79

Residue

Range, °F.: 650+
Yield, vol %: 55.11
Gravity, °API: 12.28
Sulfur, wt %: 2.3
Ni/V, ppm: 26/176

Loreto, Peru

Puerto Bayovar

Crude

Gravity, °API: 34.0
Sulfur, wt %: 0.29
Pour pt., °F.: 34
Vis., SUS @ 80° F.: 53.3
V/Ni, ppm: 63/34

Light naphtha

Range, °C.: lbp-45
Yield, vol %: 2.41

Naphtha

Range, °C.: 45-104
Yield, vol %: 7.11
Paraffins, vol %: 68.3
Naphthenes, vol %: 29.9
Aromatics, vol %: 1.8

Heavy naphtha

Range, °C.: 104-199
Yield, vol %: 18.24
P/N/A, vol %: 49.9/39.2/10.3

Kerosine

Range, °C.: 199-288
Yield, vol %: 18.95
Sulfur, wt %: 0.05
Pour pt., °C.: -37
Cetane index: 46.3

Residue

Range, °C.: 343+
Yield, vol %: 41.3
Gravity, °API: 18.9
Sulfur, wt %: 0.51

Maya, Mexico

Pajaritos, Veracruz and Salina Cruz (Pacific), Oaxaca

Crude

Gravity, °API @ 60° F.: 22.0
Sulfur, wt %: 3.32
Pour test, °F.: 0
Vis., SUS @ 70° F.: 1,024.57
Vis., SUS @ 100° F.: 333.62
Rvp, psi @ 100° F.: 4.7
Hydrogen sulfide, ppm: 199
NC₄ & lighter, vol %: 1.5

Light straight run

Range, °F.: 60-200
Yield, vol %: 5.2
Total sulfur, wt %: 0.025
RON clear: 57.7
RON + 3 ml TEL/gal: 80.9

Naphtha

Range, °F.: 60-400
Yield, vol %: 19.7
Paraffins, vol %: 60.60
Naphthenes, vol %: 27.03
Aromatics, vol %: 12.37
Total sulfur, wt %: 0.213
RON clear: 38.1
RON + 3 ml TEL/gal: 57.6

Kerosine

Range, °F.: 400-500
Yield, vol %: 9.6
Gravity, °API: 39.6
Freezing pt, °F.: -29
P/N/A, vol %: 45.4/33.7/20.9
Total sulfur, wt %: 1.16
Aniline pt, °F.: 142.2
Smoke pt, mm: 20

Light gas oil

Range, °F.: 500-650
Yield, vol %: 12.8
Gravity, °API: 30.6
Pour pt, °F.: +30
P/N/A, vol %: 36.8/34.1/29.1
Total sulfur, wt %: 2.17
Carbon residue, Rams., wt %: 0.08
Aniline pt, °F.: 152.8
Cetane index: 51.0

Topped crude

Range, °F.: 650+
Yield, vol %: 56.4
Gravity, °API: 7.7
Vis., SUS @ 210° F.: 3,370.63
Vis., SUS @ 122° F.: 23,755.00
Pour pt, °F.: +115
Total sulfur, wt %: 5.04
Carbon residue, Rams., wt %: 17.83
Nitrogen, %: 0.4245
Ni/V, ppm: 87.8/535.0

Vacuum gas oil

Range, °F.: 650-1,100+
Yield, vol % (of crude): 25.2
Gravity, °API: 18.3
Aniline pt, °F.: 167.4
Vis., SUS @ 130° F.: 270.17
Pour pt, °F.: +105
Sulfur, wt %: 3.14
Carbon residue, Rams., wt %: 0.69
Ni/V, ppm: 0.9/1.9

Vacuum residue

Range, °F.: 1,100+
Yield, vol % (of crude): 31.2
Gravity, °API: 0.5
Vis., SUS @ 275° F.: Too hard
Sulfur, wt %: 5.78
Carbon residue, Rams., wt %: 26.2
Ni/V, ppm: 149/913

Merrey, Venezuela**Puerto La Cruz,
State of Anzoategui****Crude**

Gravity, °API: 17.4
Sulfur, wt %: 2.2
Vis., SUS @ 100° F.: 1,207
Pour pt, °F.: -10
Yield, 0°(IVT)-82° F., vol %: 0.54

Light naphtha

Range, °F.: 82-200
Yield, vol %: 1.61
RON clear: 74.7

Heavy naphtha

Range, °F.: 200-300
Yield, vol %: 3.21
Sulfur, wt %: 0.01
Paraffins, vol %: 43.9
Naphthenes, vol %: 41.55
Aromatics, vol %: 15.17

Naphtha

Range, °F.: 300-390
Yield, vol %: 1.91
Sulfur, wt %: 0.036
P/N/A, vol %: 43.19/42.30/14.50

Kerosine

Range, °F.: 350-400
Yield, vol %: 2.37

Sulfur, wt %: 0.09
Aromatics, vol %: 13.95
Smoke pt, mm: 21.37
Aniline pt, °F.: 126.6

Gas oil

Range, °F.: 400-500
Yield, vol %: 7.21
Gravity, °API: 34.89
Sulfur, wt %: 0.33
Aromatics, vol %: 17.10
Smoke pt, mm: 13.45
Cetane no.: 35.62
Aniline pt, °F.: 135.51
Cetane index: 38.94

Gas oil

Range, °F.: 500-550
Yield, vol %: 4.52
Gravity, °API: 30.82
Sulfur, wt %: 0.7037

Gas oil

Range, °F.: 550-650
Yield, vol %: 10.47
Gravity, °API: 27.13
Sulfur, wt %: 1.15

Residue

Range, °F.: 650+
Yield, vol %: 68.16
Sulfur, wt %: 2.8
Ni/V, ppm: 74.77/301.08

Oriente, Ecuador**Puerto Balao/
Esmeraldas, Ecuador****Crude**

Gravity, °API: 29.2
Sulfur, wt %: 1.01
Vis., cSt @ 104° F.: 13.0
Pour pt, °F.: 25.0
C₆ & lighter, vol %: 4.7
Rvp @ 100° F., psi: 3.70
Ni/V, ppm: 39/65

Light naphtha

Range, °F.: 1bp-200
Yield, vol %: 3.9
Sulfur, wt %: 0.001
Paraffins, vol %: 62.4
Naphthenes, vol %: 35.0
Aromatics, vol %: 2.6
RON clear: 67.3

Heavy naphtha

Range, °F.: 200-400
Yield, vol %: 17.3
Sulfur, wt %: 0.01
P/N/A, vol %: 44.9/45.8/9.3
RON clear: 45.9
Aniline pt, °F.: 130

Kerosine

Range, °F.: 400-500
Yield, vol %: 6.4
Gravity, °API: 40.6
Sulfur, wt %: 0.16
Vis., cSt @ 104° F.: 1.78
Smoke pt, mm: 20
Freezing pt, °F.: -41
Aniline pt, °F.: 142

Gas oil

Range, °F.: 500-620
Yield, vol %: 14.7
Gravity, °API: 35.1
Sulfur, wt %: 0.49
Vis., cSt @ 104° F.: 3.33
Pour pt, °F.: 5
Aniline pt, °F.: 153

Vacuum gas oil

Range, °F.: 620-1,000
Yield, vol %: 32.0
Gravity, °API: 25.2
Sulfur, wt %: 1.14
Vis., cSt @ 104° F.: 33.0
Pour pt, °F.: 90
Ni/V, ppm: 1/<1

Residue

Range, °F.: 620+
Yield, vol %: 51.5
Gravity, °API: 17.0
Sulfur, wt %: 1.66
Vis., cSt @ 104° F.: 649
Vis., cSt @ 212° F.: 34.1

**Tia Juana Light,
Venezuela****La Salina,
State of Zulia****Crude**

Gravity, °API: 32.1
Sulfur, wt %: 1.1
Kin. vis., SSU @ 100° F.: 60
Pour pt, °F.: -45
Yield, 0°(IVT)-82° F., vol %: 2.16

Light naphtha

Range, °F.: 82-200
Yield, vol %: 5.19

Heavy naphtha

Range, °F.: 200-300
Yield, vol %: 10.82
Sulfur, wt %: 0.0017
Paraffins, %: 65.99
Naphthenes, %: 24.30
Aromatics, %: 9.71
RON clear: 53.6

Naphtha

Range, °F.: 300-350
Yield, vol %: 4.82
Sulfur, wt %: 0.0077
P/N/A, %: 51.23/31.69/17.08

Kerosine

Range, °F.: 350-400
Yield, vol %: 4.64
Sulfur, wt %: 0.0281
P/N/A, %: 45.77/35.64/18.58
Smoke pt, mm: 23.37
Aniline pt, °F.: 134.99

Gas oil

Range, °F.: 400-500
Yield, vol %: 10.41
Gravity, °API: 40.72
Sulfur, wt %: 0.11
Smoke pt, mm: 14.99
Aniline pt, °F.: 147.31
Cetane index: 50.43

Gas oil

Range, °F.: 500-550
Yield, vol %: 4.96
Gravity, °API: 36.17
Sulfur, wt %: 0.4540
Smoke pt, mm: 11.99
Aniline pt, °F.: 158.47

Gas oil

Range, °F.: 550-650
Yield, vol %: 9.25
Gravity, °API: 32.39
Sulfur, wt %: 0.78
Smoke pt, mm: 14.42
Aniline pt, °F.: 168.05

Residue

Range, °F.: 650+
Yield, vol %: 47.75
Gravity, °API: 16.46
Sulfur, wt %: 1.87
Ni/V, ppm: 26/224

Tia Juana Pesado (Heavy), Venezuela

*Puerto Miranda,
Lake Maracaibo*

Crude

Gravity, °API: 12.10
Sulfur, wt %: 2.7
Kin vis., cSt @ 122° F.: 2,983
Pour pt., °F.: 30
Yield, O (IVT)-82° F., vol %: 0.08

Naphtha

Range, °F.: 82-200
Yield, vol %: 0.10

Heavy naphtha

Range, °F.: 200-300
Yield, vol %: 0.53
Sulfur, wt %: 0.209

Naphtha

Range, °F.: 300-350
Yield, vol %: 0.52
Sulfur, wt %: 0.21

Kerosine

Range, °F.: 350-400
Yield, vol %: 0.90
Sulfur, wt %: 0.24
Aromatics, %: 13.31
Smoke pt., mm: 20.53
Aniline pt., °F.: 122.34

Gas oil

Range, °F.: 400-500
Yield, vol %: 4.52
Gravity, °API: 31.9
Sulfur, wt %: 0.6
Smoke pt., mm: 13.26
Aniline pt., °F.: 128.0
Cetane no.: 32.46
Cetane index: 33.27

Gas oil

Range, °F.: 500-550
Yield, vol %: 3.12
Sulfur, wt %: 0.93

Gas oil

Range, °F.: 550-650
Yield, vol %: 7.92
Gravity, °API: 22.96
Sulfur, wt %: 1.51

Residue

Range, °F.: 650+
Yield, vol %: 82.15
Gravity, °API: 8.94
Sulfur, wt %: 3.0
V, ppm: 532

Bombay High, India

*Floating storage in Arabian
Sea producing area*

Crude

Gravity, °API: 39.35
Rvp @ 38° C., kg/sq cm: 0.34
Pour pt., °C.: +30
Kin vis., cSt @ 40° C.: 3.28
Sulfur, wt %: 0.17
Salt content, lb/1,000 bbl: 11
Con. carbon, wt %: 1.2
Wax (E.H.), wt %: 10.6

Yield, vol %: 20.6
Gravity, °API: 58.42
Charac. factor K UOP: 11.7
V/Ni/Fe, ppm: 0.3/1.0/<0.3

Naphtha

Range, °C.: C₉-150
Yield, wt %: 18.6
Rvp, kg/sq cm @ 38° C.: 0.42
Sulfur, total, ppm: 3.0
Mercaptan sulfur, ppm: 1.3
Paraffins, vol %: 53.7
Naphthenes, vol %: 25.0
Aromatics, vol %: 21.3
RON, clear: 69.6
RON + 0.56 g Pb/l as TEL: 82.1

Kerosine

Range, °C.: 140-240
Yield, wt %: 19.3
Yield, vol %: 19.6
Gravity, °API: 43.75
Sulfur, total, ppm: 66
Mercaptan sulfur, ppm: 1.5
Flash pt. (Abel), °C.: 46.5
Smoke pt., mm: 19
Freezing pt., °C.: -54.0
Aniline pt., °C.: 52.2
Kin vis., cSt @ -30° C.: 4.18
P/N/A, vol %: 39.8/23.9/26.3

Gas oil

Range, °C.: 240-370
Yield, wt %: 25.6
Yield, vol %: 25.2
Gravity, °API: 34.25
Pour pt., °C.: +3
Kin vis., cSt @ 37.8° C.: 4.17
Sulfur, total, wt %: 0.14
Aniline pt., °C.: 73.2
Diesel index: 56

Vacuum gas oil

Range, °C.: 370-550
Yield, wt %: 29.3
Yield, vol %: 27.5
Gravity, °API: 29.86
Pour pt., °C.: +51
Kin vis., cSt @ 70° C.: 11.0
Kin vis., cSt @ 98.9° C.: 5.65
Con. carbon, wt %: 0.17
Asphaltene, wt %: 0.06
V/Ni/Cu/Fe, ppm: <0.3/<0.3/<0.1/<0.3

Residue

Range, °C.: 370+
Yield, vol %: 34.6
Yield, vol %: 31.0
Gravity, °API: 21.24
Pour pt., °C.: +51
Sulfur, total, wt %: 0.38
Kin vis., cSt @ 98.9° C.: 14.37
Kin vis., cSt @ 70° C.: 24.66
Con. carbon, wt %: 4.33
Asphaltene, wt %: 1.22
V/Ni/Cu/Fe, ppm: 0.8/2.8/<0.1/0.35

Residue

Range, °C.: 550+
Yield, wt %: 5.3
Yield, vol %: 3.5
Gravity, °API: 7.86
Pour pt., °C.: +78
Sulfur, total, wt %: 0.77
Kin vis., cSt @ 98.9° C.: 1,396.58
Con. carbon, wt %: 23.70
Asphaltene, wt %: 8.40
V/Ni/Cu/Fe, ppm: 5.0/18.0/<0.1/1.9

North America

Bow River Heavy, Alberta

*Bow River Pipe Lines Ltd. to
Edmonton**

Crude

Gravity, °API: 26.7
Sulfur, g/kg: 21.0
Rvp, kPa: 37.2
Pour pt., °C.: -50.0
Con. carbon, wt %: 6.70
Vis., cSt @ 40° C.: 18.30
Ni/V, wt ppm: 20.7/54.0
C₃, yield, vol %: 0.41
C₄s, yield, vol %: 1.47

Naphtha

Range, °C.: C₉-190
Yield, vol %: 20.40
Sulfur, g/kg: 0.61
Paraffins, vol %: 65.50
Olefins, vol %: 0.40
Naphthenes, vol %: 26.80
Aromatics, vol %: 7.30

Kerosine

Range, °C.: 190-277
Yield, vol %: 13.10
Sulfur, g/kg: 4.40
P/O/N/A, vol %: 73.20/2.60/0.00/24.20
Aniline pt., °C.: 57.7
Pour pt., °C.: -60.6
Cetane no.: 44.0
Cetane index: 52.3
Smoke pt., mm: 27.0

Distillate

Range, °C.: 277-343
Yield, vol %: 10.80
Gravity, °API: 29.6
Sulfur, g/kg: 10.30
Aromatics, vol %: 55.10
Aniline pt., °C.: 63.9
Pour pt., °C.: -35.0
Cetane no.: 46.0
Cetane index: 49.6
Vis., cSt @ 38° C.: 5.57

Gas oil

Range, °C.: 343-565
Yield, vol %: 32.50
Gravity, °API: 20.9
Sulfur, g/kg: 21.00
Total nitrogen, wt %: 0.03
Pour pt., °C.: 12.1
Con. carbon, wt %: 0.60
Vis., cSt @ 38° C.: 57.30
Ni/V, ppm: 0.00/0.12

Residue

Range, °C.: 565+
Yield, vol %: 23.20
Gravity, °API: 5.3
Sulfur, g/kg: 38.20
Pour pt., °C.: 73.0
Vis., cSt @ 135° C.: 940
Penetration @ 25° C.: 19
Ni/V, wt ppm: 67.70/169.00

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton

Cold Lake,* Alberta

*Alberta Oil Sands Pipeline
Ltd. to Edmonton†*

Crude

Density, g/cu cm: 0.9031
Sulfur, wt %: 2.91
Vis., cSt @ 15° C.: 70.7

Neut. No.: 0.71
Nitrogen, wt %: 0.29
Pour pt, °C: - 60
C₅ & lighter yield, vol %: 7.43

Naphtha
Range, °C: 20-175
Yield, vol %: 30.0
RON clear: 63.7
Sulfur, wt %: 0.06

Distillate
Range, °C: 175-295
Yield, vol %: 10.5
Density, kg/cu cm @ 15° C: 0.7983
Sulfur, wt %: 0.76
Aniline pt, °C: 56
Vis., cSt @ 40° C: 2.0
Freezing pt, °C: - 61.5
Pour pt, °C: - 51
Smoke pt, °C: 18.4

Gas oil
Range, °C: 343-517
Yield, vol %: 18.7
Density, kg/cu cm @ 15° C: 0.9536
Sulfur, wt %: 2.96
Nitrogen, wt %: 0.08
Ni/V, wt ppm: 0.05/0.15

Residue
Range, °C: 343+
Yield, vol %: 51.6
Density, kg/cu cm: 1.0203
Sulfur, wt %: 4.8
Vis., cSt @ 60° C: 7.750
Pour pt, °C: +51
Ni/V/Fe, wt ppm: 90.6/213.7/12.8

Asphalt
Range, °C: 405+
Yield, vol %: 47.8
Density @ 15° C, kg/cu m: 1.030.7
Pen. @ 25° C (100.5): 343
Pen. @ 4° C (100.5): 36
Pen. index: - 1.01
Vis. @ 60° C, Poises: 298
Vis. @ 100° C, cSt: 994

Asphalt
Range, °C: 470+
Yield, vol %: 37.7
Density @ 15° C, kg/cu m: 1.046.9
Pen. @ 25° C (100.5): 60
Pen. @ 4° C (100.5): 6
Pen. index: - 0.46
Vis. @ 60° C, Poises: 3.576
Vis. @ 100° C, cSt: 4.894

*Diluent added to crude to permit pipeline transportation. This assay made on blend of 28 wt % mixed condensate (gravity, °API: 58.9) and 72 wt % Cold Lake Crude that had the following characteristics:

Gravity, °API: 13.2
Density @ 15° C: 0.9770
Sulfur, wt %: 4.11
Nitrogen, wt %: 0.42
Pour pt, °C: - 4
Vis., cSt @ 40° C: 1.057
Vis., cSt @ 80° C: 98

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton

Federated Light and Medium, Alberta

Federated Pipe Line Ltd. to Edmonton*

Crude
Gravity, °API: 39.7
Sulfur, g/kg: 2.01
Total nitrogen, wt %: 0.11

Rvp, kPa: 31.0
Pour pt, °C: - 10.0
Con. carbon, wt %: 1.46
Vis. cSt @ 40° C: 3.30
Wax, wt %: 9.12
Neut. value, mg: 0.00
Ni/V, ppm: 0.07/0.00
C₄ & lighter, vol %: 3.43

Naphtha
Range, °C: C₅-190
Yield, vol %: 30.90
Sulfur, g/kg: 0.05
Paraffins, vol %: 28.30
Naphthenes, vol %: 54.90
Aromatics, vol %: 16.80
RON clear: 56.4

Kerosine
Range, °C: 190-277
Yield, vol %: 18.25
Gravity, °API: 41.0
Sulfur, g/kg: 0.68
Aromatics, vol %: 23.00
Aniline pt, °C: 142.0
Pour pt, °C: - 40.0
Freezing pt, °C: - 39.0
Cetane no.: 47.0

Distillate
Range, °C: 277-343
Yield, vol %: 13.73
Gravity, °API: 34.6
Sulfur, g/kg: 1.97
Aniline pt, °C: 80.7
Pour pt, °C: - 7.5
Cetane no.: 55.0
Cetane index: 49.0
Vis., cSt @ 38° C: 4.43

Gas oil
Range, °C: 343-565
Yield, vol %: 28.29
Gravity, °API: 25.6
Sulfur, g/kg: 3.10
Total nitrogen, wt %: 0.16
Pour pt, °C: 40.0
Con. carbon, wt %: 0.45
Vis., cSt @ 50° C: 29.32
Ni/V, wt ppm: 1.24/0.00

Residue
Range, °C: 565+
Yield, vol %: 8.83
Gravity, °API: 15.2
Sulfur, g/kg: 5.40
Pour pt, °C: 26.0
Vis., cSt @ 135° C: 30.64
Ni/V, wt ppm: 9.50/5.70

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton

Gulf Alberta, L & M

Gulf Alberta Pipeline to Edmonton*

Crude
Gravity, °API: 35.1
Sulfur, g/kg: 9.80
H₂S, wt ppm: 58.1
Rvp, kPa: 36.4
Pour pt, °C: - 27.5
Vis., cSt @ 40° C: 4.86
Ni/V, wt ppm: 10.10/9.00
C₄ & lighter, yield, vol %: 3.50

Naphtha
Range, °C: C₅-190
Yield, vol %: 30.60
Sulfur, g/kg: 0.36
Paraffins, vol %: 56.04
Olefins, vol %: 0.00
Naphthenes, vol %: 31.53
Aromatics, vol %: 12.43

Kerosine
Range, °C: 190-277
Yield, vol %: 14.20
Gravity, °API: 39.9
Sulfur, g/kg: 2.76
Aromatics, vol %: 28.13
Aniline pt, °C: 59.7
Pour pt, °C: - 40.0
Cetane no.: 46.0
Cetane index: 49.0
Smoke pt, mm: 19.0

Distillate
Range, °C: 277-343
Yield, vol %: 8.53
Gravity, °API: 22.1
Sulfur, g/kg: 7.67
Aniline pt, °C: 70.0
Pour pt, °C: - 10.0
Cetane no.: 52.0
Cetane index: 55.0
Vis., cSt @ 38° C: 5.14

Gas oil
Range, °C: 343-565
Yield, vol %: 31.43
Gravity, °API: 23.8
Sulfur, g/kg: 12.72
Total nitrogen, wt %: 0.13
Pour pt, °C: 31.0
Con. carbon, wt %: 0.23
Vis., cSt @ 38° C: 44.22
Ni/V, ppm: 0.40/0.00

Residue
Range, °C: 565+
Yield, vol %: 15.2
Gravity, °API: 14.6
Sulfur, g/kg: 23.87
Pour pt, °C: 44.0
Vis., cSt @ 135° C: 59.97
Ni/V, wt ppm: 24.10/25.10

*Access to Interprovincial and Trans Mountain pipelines at Edmonton

Lloydminster,* Alberta and Saskatchewan

Husky Oil Operations Ltd. pipeline to Hardisty, Alta.†

Crude
Gravity, °API: 20.7
Sulfur, g/kg: 31.5
Rvp, kPa: 30.3
Pour pt, °C: - 32.0
Con. carbon, wt %: 9.18
Vis., cSt @ 40° C: 101.00
Neut. value, mg: 0.78
Ni/V, wt ppm: 52.70/10.50
C₄ & lighter, yield, vol %: 0.48

Naphtha
Range, °C: C₅-190
Yield, vol %: 19.50
Sulfur, g/kg: 0.79
Paraffins, vol %: 55.10
Olefins, vol %: 1.50
Naphthenes, vol %: 31.60
Aromatics, vol %: 11.80

Kerosine
Range, °C: 190-277
Yield, vol %: 9.80
Gravity, °API: 34.9
Sulfur, g/kg: 5.05
Aromatics, vol %: 22.40
Aniline pt, °C: 52.4
Pour pt, °C: - 63.3
Cetane no.: 35.0
Smoke pt, mm: 19.0

Distillate
Range, °C: 277-343
Yield, vol %: 9.50

Gravity, °API: 26.5
Sulfur, g/kg: 8.45
Aromatics, vol %: 38.90
Aniline pt, °C: 56.5
Pour pt, °C: 31.1
Cetane no.: 40.0
Cetane index: 41.5
Vis., cSt @ 38° C: 6.32

Gas oil

Range, °C: 343-565
Yield, vol %: 25.20
Gravity, °API: 17.5
Sulfur, g/kg: 28.50
Aniline pt, °C: 72.2
Pour pt, °C: 1.7
Con. carbon, wt %: 0.55
Vis., cSt @ 38° C: 155.00
Ni/V, wt ppm: 0.00/0.10

Residue

Range, °C: 565+
Yield, vol %: 36.00
Gravity, °API: 2.9
Sulfur, g/kg: 56.90
Pour pt, °C: 69.0
Con. carbon, wt %: 25.10
Vis., cSt @ 135° C: 3,260
Ni/V, wt ppm: 123/231

*Crude has been blended with pipeline condensate to permit transportation. Typically 20-25% condensate is added to crude.
†Has access to Interprovincial pipeline at Hardisty.

Rainbow Light and Medium, Alberta

Rainbow Pipe Line Co. Ltd. to Edmonton*

Crude

Gravity, °API: 40.7
Sulfur, g/kg: 5.00
H₂S, wt ppm: 10.2
Rvp, kPa: 33.9
Pour pt, °C: 2.5
Con. carbon, wt %: 1.65
Vis., cSt @ 40° C: 3.77
Wax, wt %: 20.40
Neut. value, mg: 0.08
Ni/V, wt ppm: 0.85/0.50
C₄ & lighter, yield, vol %: 3.40

Naphtha

Range, °C: C₅-190
Yield, vol %: 38.70
Sulfur, g/kg: 0.14
Paraffins, vol %: 61.25
Naphthenes, vol %: 25.96
Aromatics, vol %: 12.79
RON clear: 51.2
MON clear: 51.4

Kerosine

Range, °C: 190-277
Yield, vol %: 13.00
Gravity, °API: 42.2
Sulfur, g/kg: 1.20
Aromatics, vol %: 24.23
Aniline pt, °C: 62.3
Pour pt, °C: -37.5
Freezing pt, °C: -35.0
Cetane no.: 46.0
Cetane index: 47.8
Smoke pt, mm: 20.0
Vis., cSt @ 40° C: 1.55

Distillate

Range, °C: 277-343
Yield, vol %: 11.50
Gravity, °API: 35.0
Sulfur, g/kg: 4.40
Aniline pt, °C: 75.5

Pour pt, °C: -5.0
Cetane no.: 59.0
Cetane index: 55.0
Vis., cSt @ 38° C: 4.51

Gas oil

Range, °C: 343-565
Yield, vol %: 31.65
Sulfur, g/kg: 8.04
Total nitrogen, wt %: 0.69
Pour pt, °C: 26.0
Con. carbon, wt %: 0.16
Vis., cSt @ 50° C: 20.39
Asphaltenes, vol %: 4.10
Ni/V, wt ppm: 0.02/0.00

Residue

Range, °C: 565+
Yield, vol %: 5.15
Gravity, °API: 19.6
Sulfur, g/kg: 10.71
Total nitrogen, wt %: 3.22
Pour pt, °C: 28.0
Con. carbon, wt %: 11.11
Vis., cSt @ 135° C: 27.82
Asphaltenes, wt %: 13.42
Ni/V, wt ppm: 4.60/2.90

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton.

Rangeland-South L & M, Alberta

Rangeland Pipe Line Co. to Canadian/U.S. border near Carway, Alta.

Crude

Gravity, °API: 39.5
Sulfur, g/kg: 7.52
H₂S, wt ppm: 20.1
Rvp, kPa: 39.3
Pour pt, °C: -40.0
Con. carbon, wt %: 0.69
Vis., cSt @ 40° C: 2.67
Wax, wt %: 12.44
Neut. value, mg: 0.12
Ni/V, wt ppm: 1.20/1.40
C₄ & lighter, yield, wt %: 3.22

Naphtha

Range, °C: C₅-190
Yield, vol %: 38.75
Sulfur, g/kg: 0.12
Rvp, kPa: 41.1
Paraffins, vol %: 42.45
Naphthenes, vol %: 36.86
Aromatics, vol %: 20.69
RON clear: 58.5
MON clear: 57.3

Kerosine

Range, °C: 190-277
Yield, vol %: 15.50
Gravity, °API: 38.3
Sulfur, g/kg: 1.87
Aromatics, vol %: 24.0
Aniline pt, °C: 62.0
Pour pt, °C: -37.5
Freezing pt, °C: -28.5
Cetane no.: 48.0
Smoke pt, mm: 20.0

Distillate

Range, °C: 277-343
Yield, vol %: 8.55
Gravity, °API: 32.0
Sulfur, g/kg: 4.79
Aniline pt, °C: 71.0
Pour pt, °C: -7.5
Cetane no.: 51.0
Cetane index: 52.0
Vis., cSt @ 38° C: 5.24

Gas oil

Range, °C: 343-565
Yield, vol %: 33.20
Gravity, °API: 26.5
Sulfur, g/kg: 11.64
Total nitrogen, wt %: 0.62
Aniline pt, °C: 86.6
Pour pt, °C: 24.0
Con. carbon, wt %: 0.10
Vis., cSt @ 38° C: 42.02

Residue

Range, °C: 565+
Yield, vol %: 4.0
Gravity, °API: 21.7
Sulfur, g/kg: 12.19
Pour pt, °C: 27.5
Vis., cSt @ 135° C: 18.75
Asphaltenes, wt %: 10.13
Ni/V, wt ppm: 3.0/7.4

Wainwright—Kinsella,* Alberta

Husky Oil Operations Ltd. pipeline to Hardisty, Alta.†

Crude

Gravity, °API: 23.1
Sulfur, g/kg: 15.80
Rvp, kPa: 30.3
Pour pt, °C: -39.0
Con. carbon, wt %: 6.70
Vis., cSt @ 40° C: 32.50
Ni/V, ppm: 40.30/79.90

Naphtha

Range, °C: C₅-190
Yield, vol %: 19.0
Sulfur, g/kg: 0.50
Paraffins, vol %: 52.50
Naphthenes, vol %: 37.80
Aromatics, vol %: 8.90

Kerosine

Range, °C: 190-277
Yield, vol %: 12.00
Gravity, °API: 36.3
Sulfur, g/kg: 3.44
Aromatics, vol %: 22.80
Aniline pt, °C: 56.7
Freezing pt, °C: -51.6
Cetane no.: 37.0
Smoke pt, mm: 26.0

Distillate

Range, °C: 277-343
Yield, vol %: 11.0
Gravity, °API: 28.1
Sulfur, g/kg: 10.50
Aromatics, vol %: 33.70
Aniline pt, °C: 60.5
Pour pt, °C: -22.0
Cetane no.: 42.0
Cetane index: 43.9
Vis., cSt @ 38° C: 5.69

Gas oil

Range, °C: 343-565
Yield, vol %: 26.00
Gravity, °API: 19.1
Sulfur, g/kg: 21.80
Total nitrogen, wt %: 0.03
Pour pt, °C: 12.8
Vis., cSt @ 38° C: 131.0
Con. carbon, wt %: 0.55
Ni/V, wt ppm: 0.11/0.00

Residue

Range, °C: 565+
Yield, vol %: 32.0
Gravity, °API: 3.7
Sulfur, g/kg: 52.60
Pour pt, °C: 74.0
Vis., cSt @ 135° C: 212.00
Asphaltenes, wt %: 19.10
Ni/V, ppm: 110/222

*Note: crude blended with condensate to permit transportation.

†Has access to Interprovincial Pipeline.

U.S. Alaska North Slope (ANS, Sadlerochit)

Trans Alaska Pipeline to Valdez Terminal

Crude

Gravity, °API: 26.4
Sulfur, wt %: 1.06
Pour pt, °F: 0
Rvp, psi: 3.55
Kin vis. @ 60° F: 42.42
H₂S, lb/1,000 bbl: 0.35
Salt, lb/1,000 bbl: 32.7
Carbon residue, wt %: 4.40
Neut. no. (D974): 1.12
Ni/V, ppm: 11/26
Nitrogen, ppm: 2.090
C₄ & lighter, yield, vol %: 1.17

Light gasoline

Range, °F: C₅-150
Yield, vol %: 2.2
Sulfur, wt %: <0.001
RON clear: 71.5
MON clear: 69.8
RON + 0.5g TEL/gal: 78.4

Naphtha

Range, °F: 150-380
Yield, vol %: 15.6
Sulfur, wt %: 0.013
Paraffins, vol %: 39.7
Naphthenes, vol %: 43.3
Aromatics, vol %: 17.0

Distillate

Range, °F: 380-650
Yield, vol %: 28.6
Gravity, °API: 33.1
Sulfur, wt %: 0.414
Pour pt, °F: -25
Cetane No.: 45.8
Total N₂, ppm: 79
Aromatics, vol %: 33.6

Blended gas oil

Range, °F: 650-840
Yield, vol %: 16.4
Gravity, °API: 23.8
Sulfur, wt %: 1.10
Aniline pt, °C: 74.7
Pour pt, °F: 70
Carbon residue, %: 0.012
Total nitrogen, ppm: 950
Basic nitrogen: 0.03

Residue

Range, °F: 650+
Yield, vol %: 52.4
Gravity, °API: 15.0
Sulfur, wt %: 1.63
Carbon residue, %: 8.82
Total nitrogen, ppm: 3,300
Pour pt, °F: 80
Kin. vis. @ 210° F: 47.54
Kin. vis. @ 275° F: 15.55

Note: This assay is of Sadlerochit crude, originally the only component of North Slope crude. Kuparuk crude is now blended at a rate of about 120,000 b/d with Sadlerochit at pumpstation No. 1. Total ANS stream is about 1.6 million b/d. See Kuparuk analysis in this section.

Kuparuk,* Alaska

Trans Alaska Pipeline to Valdez Terminal

Crude

Gravity, °API: 23.0
Sulfur, wt %: 1.76
Pour pt, °F: -55
Rvp, psi: 2.6
Kin vis. @ 60° F, cSt: 79.98
H₂S, lb/1,000 bbl: <5
Carbon residue, wt %: 7.37
Ni/V, ppm: 19/57
Nitrogen, ppm: 1.980
C₄ & lighter, vol %: 2.12

Light gasoline

Range (TBP), °F: C₅-150
Yield, vol %: 1.6
Sulfur, wt %: 0.006

Naphtha

Range, °F: 150-380
Yield, vol %: 14.5
Sulfur, wt %: 0.018
Paraffins, vol %: 38.3
Naphthenes, vol %: 47.0
Aromatics, vol %: 14.7

Distillate

Range, °F: 380-650
Yield, vol %: 26.9
Sulfur, wt %: 0.66
Pour pt, °F: -25
Cetane No.: 45.4
Vis, cSt @ 100° F: 3.083
Aromatics, wt %: 30.0

Gas oil

Range, °F: 650-840
Yield, vol %: 18.9
Gravity, °API: 20.5
Sulfur, wt %: 1.79
Aniline pt, °C: 104.3
Pour pt, °F: 50
Kin vis. @ 100° F: 34.20
Carbon residue, wt %: 0.01
Total nitrogen, ppm: 600
Basic nitrogen, wt %: 0.02
V.Ni, ppm: <1

Residue

Range, °F: 650+
Yield, vol %: 56.0
Gravity, °API: 11.7
Sulfur, wt %: 2.59
Carbon residue, wt %: 12.61
Pour pt, °F: 40
Kin vis. @ 210° F: 97.15

*About 120,000 b/d of Kuparuk is blended with some 1.6 million b/d of Sadlerochit crude to produce North Slope crude. Kuparuk contribution is expected to double by early 1985.

West Sak,* Alaska

Not in production

Crude

Gravity, °API: 22.4
Sulfur, wt %: 1.82
Pour pt, °F: -50
Rvp, psi: 2.70
Kin vis. @ 60° F: 95.92
Carbon residue, wt %: 7.62
Ni/V, ppm: 22/61
Neut. no. (D974): 0.68
C₄ & lighter, yield, vol %: 0.63

Light gasoline

Range, °F: C₅-150
Yield, vol %: 1.9
Sulfur, wt %: 0.004

Naphtha

Range, °F: 150-380
Yield, vol %: 14.4
Sulfur, wt %: 0.018
Paraffins, vol %: 36.4
Naphthenes, vol %: 48.2
Aromatics, vol %: 15.4

Distillate

Range, °F: 380-650
Yield, vol %: 27.5
Gravity, °API: 31.6
Sulfur, wt %: 0.700
Pour pt, °F: -35
Cetane no.: 42.1
Aromatics, vol %: 31.4
Vis., cSt @ 100° F: 3.34

Gas oil

Range, °F: 650-840
Yield, vol %: 16.6
Gravity, °API: 21.1
Sulfur, wt %: 1.81
Pour pt, °F: 60
Kin vis. @ 100° F: 43.99
Total nitrogen, ppm: 840
Basic nitrogen: 0.023

Residue

Range, °F: 650+
Yield, vol %: 55.6
Gravity, °API: 10.8
Sulfur, wt %: 2.53
Carbon residue, wt %: 13.15
Pour pt, °F: 45
Kin vis. @ 210° F: 135.3
Pentane insoluble, wt %: 14.97

*Crude not in production, but pilot program is underway in Kuparuk area to determine feasibility. Assay sample obtained during drill stem test.

Crude oil streams by country of origin*

Abu Dhabi, U.A.E.

Abu Al Bu Khoosh—Cie. Francaise des Petroles
Murban—Abu Dhabi National Oil Co.
Umm Shaif (Abu Dhabi Marine)—Adnoc
Zakum (Lower Zakum)—Adnoc

Algeria

Saharan Blend—Sonatrach
Zarzaitine—Sonatrach

Angola

Cabinda—Cabinda Gulf Oil Co.
Soyo Blend—Cia. de Petroles de Angola and
Texaco Angola

Brunei

Champion Export—Brunei Shell
Sera Light—Brunei Shell

Cameroon

Kole Marine Blend—Elf Serepca

Canada

Bow River Heavy—Alberta Petroleum Market-
ing Commission
Cold Lake—Esso Petroleum Canada/APMC
Federated—APMC/Horne Oil Ltd.
Gulf Alberta I. & M—APMC/Gulf Canada
Lloydminster—Husky Oil Operations Ltd.
Rainbow Light & Medium—APMC/Mobil Oil

Canada

Rangeland South—APMC/Dome Petroleum
Ltd.
Wainwright-Kinsella—APMC/Husky Oil Opera-
tions Ltd.

China

Shengli—Petroleum Corp. of PRC
Taching (Daqing)—Petroleum Corp. of PRC

Congo (Brazzaville)

Djeno Blend (Djeno Melange)—Elf Congo

Denmark

Dan—Dansk Undergrunds Consortium (DUC)
Gorm—DUC

Divided Zone

Burgan (Wafra)—Getty and Kuwait Oil Co.
Eocene (Wafra)—Getty and Kuwait Oil Co.
Hout—Arabian Oil Co.
Khafji—AOC

Dubai, U.A.E.

Dubai (Fateh)—Dubai Petroleum Co.

Ecuador

Oriente—Texaco

Egypt

Belayim—AGIP
Gulf of Suez Mix—Amoco

Gabon

Gamba—Elf Gabon
Lucina Marine—Elf Gabon
Mandji—Elf Gabon

Ghana

Salt Pond—Agri-Petco

India

Bombay High—Oil & Natural Gas Commission

Indonesia

Ardjuna—Atlantic Richfield Indonesia Inc.
Arimbi—ARCO Indonesia
Ataka—Union Oil Co. of Indonesia
Badak—Roy M. Huffington Inc.
Bekapai—Total Indonesia
Bunyu—Pertamina
Cinta—Independent Indonesian American Pe-
troleum Co.
Duri (Sumatran Heavy)—Caltex Pacific Indone-
sia
Handil—Total Indonesia
Jatibarang—Pertamina
Minas (Sumatran Light)—Caltex Pacific Indone-
sia
Salawati—Phillips Petroleum Co., Indonesia
Sanga Sanga—Tesoro
Sepinggan—Yakin Mixed (4:1)—Union Oil Co.
of Indonesia
Udang—Conoco of Indonesia
Walio—Petro-Trend Corp.

Iran

Aboozar (Ardeshiri)—National Iranian Oil Co.
Bahrganzar/Nowruz (Srip Blend)—NIOC
Dorood (Danus)—NIOC
Foroozan (Fereidoon)—NIOC
Iranian Heavy—NIOC
Iranian Light—NIOC
Rostam—NIOC
Salmon (Savani)—NIOC
Siri—NIOC
Soroosh (Cyrus), Iran—NIOC

Iraq

Basrah Heavy—Iraq National Oil Co.
Basrah Light—INOC
Basrah Medium—INOC
Kirkuk Blend—INOC

Ivory Coast

Esport—Phillips Petroleum Co. Ivory Coast

Kuwait

Kuwait—Kuwait Oil Co.

Libya

Amina (high pour)—Libyan National Oil Corp.
Brega—LNOC
Bu Attifel—AGIP
Es Sider—Oasis
Sirir—LNOC
Sirica—LNOC
Zueitina—Occidental

Malaysia

Bekoh—Esso Malaysia
Bintulu—Shell Malaysia
Labuan Blend—Shell Malaysia
Mini Light—Shell Malaysia
Pulau—Esso Malaysia
Tapis—Esso Malaysia
Tapis Blend—Esso Malaysia
Tembungo—Esso Malaysia

Mexico

Isthmus—Pemex
Maya—Pemex

Nigeria

Bonny Light—Shell
Bonny Medium—Shell
Brass River—Phillips Oil Co. (Nigeria)
Escravos—Gulf Oil Co. (Nigeria)
Forcados Blend—Shell
Pennington—Texaco Overseas (Nigeria)
Qua Iboe (Nigerian Light)—Mobil Oil Nigeria

Norway

Ekofisk—Phillips Petroleum
Gullfaks—Statol
Murchison—Conoco
Statfjord—Mobil

Oman

Oman Export—Petroleum Development
(Oman) Ltd. and Elf Group

Qatar

Dukhan (Qatar land)—Qatar General Petro-
leum Corp.
Qatar Marine—QGPC

Saudi Arabia

Arabian Heavy (Safaniya)—Arabian American
Oil Co.
Arabian Light—Aramco
Arabian Light (Berri)—Aramco
Arabian Medium (Khursaniyah)—Aramco
Arabian Medium (Zulul/Marjani)—Aramco

Sharjah, U.A.E.

Mubarek—Buttes Resources Co.

Syria

Soudeh—Syrian Petroleum Co.

Trinidad

Galeota Mix (Trinidad Blend)—Amoco

Tunisia

Ashtart—Elf Agutaine
El Borma—AGIP

United Kingdom

Argyll—Hamilton Bros.
Auk—Shell/Esso
Beatrice—Bristol
Beryl—Mobil
Brae—Marathon
Brent—Shell/Esso
Brent Blend
Buchan—BP
Cormorant, North—Shell/Esso
Cormorant, South (Cormorant "A")—Shell/Esso
Dunlin—Shell/Esso
Flotta—Occidental/Texaco
Forties—BP
Fulmar—Shell/Esso
Magnus—BP
Maureen—Phillips Petroleum
Montrose—Amoco
Murchison—Conoco
Ninian Blend—Chevron/Union/BP
Statfjord—Conoco
Tartan—Texaco
Thistle—Bristol

U.S.

Alaska North Slope (ANS, Sadlerochiti)—Sohio/
Exxon/ARCO
Kuparuk—ARCO
West Sak—ARCO

U.S.S.R.

Soviet Export Blend—V/O Sojuznefteexport

Venezuela

BCF 24—Affiliate of Petroleos de Venezuela
Bachaquero—Affiliate of Petroleos de Venezue-
la
Boscan—Affiliate of Petroleos de Venezuela
Ceuta—Affiliate of Petroleos de Venezuela
Lagomedio—Affiliate of Petroleos de Venezuela
La Rosa—Affiliate of Petroleos de Venezuela
Leona—Affiliate of Petroleos de Venezuela
Merey—Affiliate of Petroleos de Venezuela
Tia Juana Light—Affiliate of Petroleos de Vene-
zuela
Tia Juana Pesado—Affiliate of Petroleos de Vene-
zuela

Zaire

Zaire—Zaire Gulf Oil Co.

*Names in parentheses are former or secondary
names of crudes. Companies listed are primary
operators or sales contacts.

Colombia's Caño Limón crude ready for export

Richard Corbett
Refining Editor

The completion of the Caño Limón pipeline and offshore loading facilities last month put Colombia's new Caño Limón crude into the world crude oil trade. Operators of the field, Empresa Colombia de Petroleos (Ecopetrol), Occidental de Colombia Inc., and Shell de Colombia Inc., expect an initial tanker loading capability of 90,000 b/d with total capacity reaching 250,000 b/d in by July.

The crude oil will be loaded from a tanker-loading facility and a floating storage unit located offshore in the Caribbean Sea at the Covenas marine terminal. The loading facility will have two CALM buoys each capable of handling 40,000 bbl/hr, and will be able to handle two shuttle tankers at once. Information regarding assays in this series, is in OGI, Apr. 11, 1983.

Caño Limón, Colombia

Covenas terminal to two CALM in Caribbean Sea

Crude

Gravity, °API: 30.8
Sulfur, wt %: 0.47
Salt, lb/1,000 bbl: 2.0
Pour pt., °F: 60
Vis., cSt @ 100° F: 12.54
Vis., cSt @ 120° F: 8.19
Neut. No., mg KOH/g: 0.27
Rvp, psi: 0.7
H₂S, scf/100 gal crude: 0.02

Light naphtha

Range, °F: IBP - 220
Gravity, °API: 72.6
Yield, vol %: 3.94
Sulfur, wt %: 0.02
Mercaptan sulfur, vol %: 0.0002
Paraffins, vol %: 76.2
Naphthenes, vol %: 23.2
Aromatics, vol %: 0.6
Rvp, psi: 8.4

Naphtia

Range, °F: 220-300
Gravity, °API: 59.3
Yield, vol %: 6.83
Sulfur, wt %: 0.01
Paraffins, vol %: 55.9
Naphthenes, vol %: 42.5
Aromatics, vol %: 1.6

Heavy naphtha

Range, °F: 300-360
Gravity, °API: 51.9
Yield, vol %: 5.64
Sulfur, wt %: 0.01
Paraffins, vol %: 52.7

Naphthenes, vol %: 43.9
Aromatics, vol %: 3.4

Kerosine

Range, °F: 360-500
Gravity, °API: 42.2
Yield, vol %: 21.09
Sulfur, wt %: 0.08
Mercaptan sulfur, vol %: 0.0004
Doctor, sweet
Smoke pt., mm: 22
Aniline pt., °F: 163
Diesel index: 68.8
Pour pt., °F: -60
W&N factor: 11.9
Vis., cSt @ 100° F: 1.95

Light gas oil

Range, °F: 500-700
Gravity, °API: 33.0
Yield, vol %: 22.04
Aniline pt., °F: 182
Diesel index: 60.1
Pour pt., °F: 30
Carbon residue, Rams., wt %: 0.08
Sulfur, wt %: 0.33
W&N factor: 11.9
Vis. cSt @ 100° F: 7.16
Vis. cSt @ 210° F: 2.04
Viscosity index: 82.4
Refractive index @ 67° C: 1.4604
Basic nitrogen, wt %: 0.0081
Bromine No.: 5.7
V/Fe/Ni, ppm: 0.05/0.05/0.05

Atmospheric residuum

Range, °F: 700 +
Gravity, °API: 15.1
Yield, vol %: 39.89

Pour pt., °F: 100
Carbon residue, Rams, wt %: 9.91
Sulfur, wt %: 0.84
W&N factor: 11.7
Vis., cSt @ 100° F: 3,700.0
Vis., cSt @ 210° F: 61.03
Viscosity index: 22.5

Vacuum gas oil

Range, °F: 700-800
Gravity, °API: 26.5
Yield, vol %: 3.16
Aniline pt., °F: 200
Diesel index: 53.0
Pour pt., °F: 90
Carbon residue, Rams., wt %: 0.32
Sulfur, wt %: 0.52
W&N factor: 12.0
Vis., cSt @ 100° F: 34.00
Vis., cSt @ 210° F: 4.83
Viscosity index: 49.6
Refractive index @ 67° C: 1.4766
Basic nitrogen, wt %: 0.0225
Bromine No.: 6.8
V/Fe/Ni, ppm: 0.05/0.20/1.40

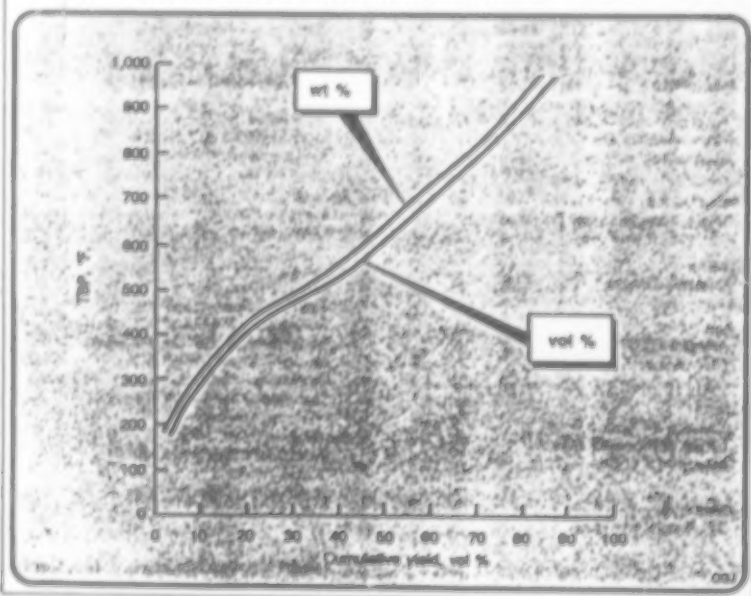
Vacuum gas oil

Range, °F: 800-1,000
Gravity, °API: 24.1
Yield, vol %: 15.01
Aniline pt., °F: 210
Diesel index: 50.6
Pour pt., °F: 105
Carbon residue, Rams, wt %: 0.44
Sulfur, wt %: 0.54
W&N factor: 12.0
Vis., cSt @ 100° F: 65.00
Vis., cSt @ 210° F: 6.72
Viscosity index: 43.1
Refractive index @ 67° C: 1.4837
Basic nitrogen, wt %: 0.0289
Bromine No.: 10.0
V/Fe/Ni, ppm: 0.05/0.05/0.70

Vacuum residuum

Range, °F: 1,000 +
Gravity, °API: 8.1
Yield, vol %: 21.74
Carbon residue, Rams., wt %: 19.26
Sulfur, wt %: 1.10
V/Fe/Ni, ppm: 41.5/12.00/95.00

Caño Limón crude oil distillation



Two high-quality onshore crude oils, Sharjah

Richard A. Corbett
Refining Editor

Two northern U.A.E. condensates are actually considered high-quality crude oils. Both have respectable yields in the gas-oil range. Sharjah Condensate is produced from the Saaja gas/condensate field in Sharjah, U.A.E. Initial production, which began in mid-1982, is now 60,000 b/d.

The condensate is transported to the Hamriyah terminal through a 20-mile, 12-in. pipeline. From the terminal, the condensate travels through a 10-in. pipeline to a single point mooring (SPM) buoy in the Persian Gulf. The SPM can handle 250,000 dwt tankers.

Margham Light is produced in Dubai. Production from the Margham gas/condensate field, discovered in 1982, is presently 25,000 b/d. The condensate moves by pipeline to the new Port of Jebel Ali outside Dubai which can handle very large crude tankers. Information regarding these assays, and previous assays in the series, is in OGI, Apr. 11, 1983.

Sharjah Condensate, Sharjah, U.A.E.

Hamriyah terminal to SPM in Persian Gulf

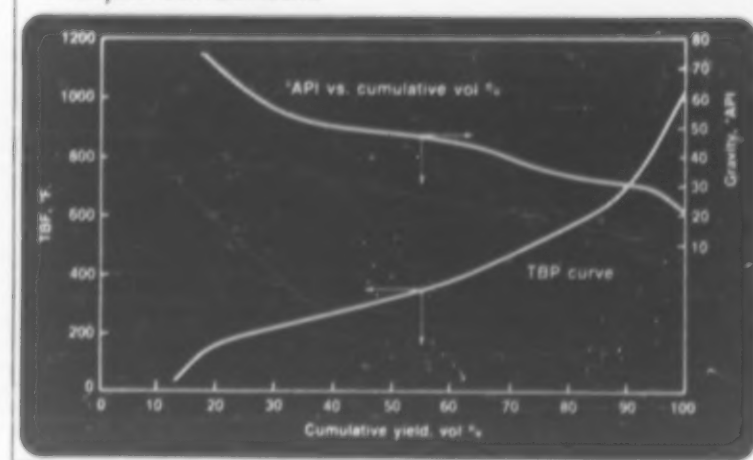
Crude

Gravity, °API: 49.7
Sp. gr. 60° F: 0.7809
Sulfur, wt %: 0.10
Rvp, psi: 10.2
Pour pt., °F: -25
Nuel. no., mg KOH/g: 0.01
Rams. car., wt %: 0.1
Kin. vis., cst. @ 68° F: 1.44
@ 100° F: 0.96
V.Ni/Fe, ppm: 0.00

Gasoline

Range, °F: C₅ - 200
Yield, vol %: 21.9
Gravity, °API: 72.8
Sulfur, wt %: 0.024
Rvp, psi: 10.7
Charac. factor: 12.16
P/N/A, vol %: 78.4/14.4/7.2
RONC: 73.7
MONC: 72.3

Sharjah condensate



Naphtha

Range, °F: 200-320
Yield, vol %: 22.3
Gravity, °API: 50.9
Sulfur, wt %: 0.008
Rvp, psi: 1.2
Charac. factor: 11.51
P/N/A, vol %: 55.9/21.5/22.6
RONC: 61.6
MONC: 60.0

Heavy naphtha

Range, °F: 320-400
Yield, vol %: 11.6
Gravity, °API: 46.8
Sulfur, wt %: 0.006
Charac. factor: 11.76
Aromatics, vol %: 27.2
Aniline pt., °F: 124.9
Diesel index: 58.4
Cetane index: 36.9
Freeze pt., °F: -74
Smoke pt., mm: 22

Kerosene

Range, °F: 320-520
Yield, vol %: 25.8
Gravity, °API: 42.2
Sulfur, wt %: 0.032
Rvp, psi: 11.69
Aromatics, vol %: 33.4
Aniline pt., °F: 137.5
Diesel index: 58.0
Cetane index: 40.3
Freeze pt., °F: -53
Cloud pt., °F: -64
Pour pt., °F: -67
Smoke pt., mm: 20
Nuel. no., mg KOH/g: 0.03
Vis., SUS @ 68° F: 31.8

Diesel

Range, °F: 520-650
Yield, vol %: 10.9

Gravity, °API: 33.8
Sulfur, wt %: 0.266
Charac. factor: 11.75
Aniline pt., °F: 166.4
Diesel index: 56.2
Cetane index: 49.5
Cloud pt., °F: 24
Pour pt., °F: 21
Nitrogen, wt %: 0.006
Nuel. no., mg KOH/g: 0.05
Vis., SUS @ 68° F: 44.8
@ 122° F: 36.3

Gas oil

Range, °F: 550-850
Yield, vol %: 9.1
Gravity, °API: 29.7
Sulfur, wt %: 0.892
Charac. factor: 11.90
Pour pt., °F: 80
Nitrogen, wt %: 0.030
Nuel. no., mg KOH/g: 0.09
Rams. car., wt %: 0.50
Vis., SUS @ 122° F: 15.2
@ 210° F: 42.8
V.Ni/Fe, ppm: 1.1

Residue

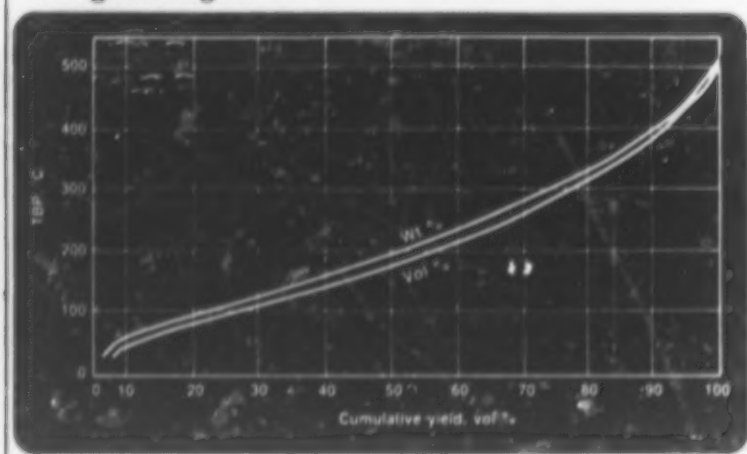
Range, °F: 850+
Yield, vol %: 13.3
Gravity, °API: 27.8
Sulfur, wt %: 0.413
Pour pt., °F: 89
Nitrogen, wt %: 0.086
Rams. car., wt %: 0.52
Vis., SUS @ 122° F: 15.2
@ 210° F: 42.8
V.Ni/Fe, ppm: 1.1

Residue

Range, °F: 850+
Yield, vol %: 4.2
Gravity, °API: 23.8
Sulfur, wt %: 0.457
Pour pt., °F: 122

Condensate and Margham Light, are assayed

Margham light



Nitrogen, wt %: 0.079
Rams. car., wt %: 1.57
Vis., SUS @ 122° F.: 281
@ 210° F.: 70.9
V/Fe, ppm: 2/2

Margham Light, Dubai, U.A.E.

Port of Jebel Ali

Crude
Gravity, °API: 50.33
Vis. cSt @ 20° C: 1.49
Pour pt., °C: -8
Rvp psi: 9.8
Salt, mg/l: 4
Water, wt %: 0.008
Water, vol %: < 0.01
H₂S, ppm: < 5
Neut. no., mg KOH/g: < 0.01
Sediment, wt %: < 0.01
Sulfur, wt %: 0.04
Wax content, wt %: 4.04
Con. carbon, wt %: 0.03
Ash, wt %: < 0.01
Asphaltenes, wt %: 0.05
Calorific value, BTU/lb: 20207
V/Ni/Na, ppm: < 0.1 < 0.1 < 0.4

Light naphtha
Range, °C: 18P-75
Yield, vol %: 12.88
Gravity, °API: 81.30
Sulfur, wt %: 0.02
Mercaptan sulfur, ppm: < 5
Paraffins, wt %: 81.6

Naphthenes, wt %: 10.9
Aromatics, wt %: 7.5
Olefins, vol %: 0.6

Naphtha
Range, °C: 75-165
Yield, vol %: 29.64
Gravity, °API: 53.15
Sulfur, wt %: 0.01
Mercaptan sulfur, ppm: < 5
Paraffins, wt %: 45.1
Naphthenes, wt %: 25.0
Aromatics, wt %: 29.9
Olefins, vol %: 1.0

Kerosene
Range, °C: 165-235
Yield, vol %: 16.89
Gravity, °API: 44.52
Sulfur, wt %: 0.02
Smoke pt., mm: 22
Freeze pt., °C: -53
Aromatics, vol %: 20.4
Flash pt., °C: 61
Copper strip corrosion: 1a
Existent gum, mg/100 ml: 1
Neut. no., mg KOH/g: < 0.01

Diesel
Range, °C: 235-300
Yield, vol %: 13.34
Gravity, °API: 37.22
Sulfur, wt %: 0.02
Cetane index: 51
Pour pt., °C: -26
Cloud pt., °C: -23
Cold filter plug pt., °C: -25
Kin. cSt @ 37.8° C: 2.79
Kin. cSt @ 50° C: 2.22
Neut. no., mg KOH/g: < 0.01
Con. carbon, 10% bott., wt %: 0.04
Flash pt., °C: 113

Copper strip corrosion: 1a
Aniline pt., °C: 70.6
Nitrogen, wt %: < 0.01

Diesel
Range, °C: 300-350
Yield, vol %: 7.25
Gravity, °API: 36.66
Sulfur, wt %: 0.27
Cetane index: 58
Pour pt., °C: 1
Cloud pt., °C: 3
Cold filter plug pt., °C: 1
Kin. cSt @ 37.8° C: 6.00
Kin. cSt @ 50° C: 4.40
Neut. no., mg KOH/g: < 0.01
Con. carbon, 10% bott., wt %: 0.73
Flash pt., °C: 159
Copper strip corrosion: 1a
Nitrogen, wt %: < 0.01

Gas oil*
Range, °C: 350-370
Yield, vol %: 2.63
Gravity, °API: 34.18
Sulfur, wt %: 0.25
Cloud pt., °C: 26
*Insufficient sample for complete analysis of this fraction.

Heavy gas oil
Range, °C: 350-514.3
Yield, vol %: 13.78
Gravity, °API: 32.04
Sulfur, wt %: 0.18
Kin. cSt @ 37.8° C: 22.5
@ 50° C: 14.6
@ 82.2° C: 6.05
@ 100° C: 4.26
Pour pt., °C: 36
Asphaltenes, wt %: < 0.05
Con. carbon, wt %: < 0.01
V/Ni, mg/kg: < 0.1 < 0.2
Neut. no., mg KOH/g: 0.05
UOP K: 12.40
Nitrogen, wt %: < 0.01
Aniline pt., °C: 103.1
Wax, wt %: 17.2
Ash, wt %: < 0.01
Sediment, wt %: < 0.01

Residue
Range, °C: 350+
Yield, vol %: 13.98
Gravity, °API: 31.73
Sulfur, wt %: 0.17
Kin. cSt @ 37.8° C: 25.2
@ 50° C: 14.9
@ 82.2° C: 6.51
@ 100° C: 4.58
Pour pt., °C: 32
Asphaltenes, wt %: < 0.05
Con. carbon, wt %: 0.04
V/Ni, mg/kg: < 0.1 < 0.9
Neut. no., mg KOH/g: 0.15
Nitrogen, wt %: 0.02
Aniline pt., °C: 102.4
Wax, wt %: 20.3
Ash, wt %: 0.01
Sediment, wt %: < 0.01

Australian regulatory changes open crudes to export

Richard A. Corbett

Refining/Petrochemical Editor

Since the price collapse of 1986, the Australian Government has been deregulating its domestic crude oils, which since the late 1960s, have been allocated solely to Australian refiners at set prices, and where no crude oil was exported.

This arrangement is now being dismantled, and has allowed export since 1983, with modest free-market sales since 1985.

Much of the exported crude is currently from older, established fields, but with a number of new fields that have come into production recently, some of the newer streams are beginning to find their way to many distant parts of the refining world.

There are five important Australian crude oils either now being, or likely to be, exported: Barrow Island and Gippsland crudes, which are produced from fields discovered in the 1960s; and Jabiru, Jackson blend, and Northwest Shelf condensate, all coming to production during the last 5 years.

Gippsland. Gippsland crude oil, also known as Bass Strait, is produced from the Gippsland basin, offshore Victoria in the eastern Bass Strait. The operator, Esso Exploration Australia, has a 50% interest in the basin, with the other 50% owned by BHP Petroleum Pty. Ltd. Production rates for crude and condensate from the basin were estimated at about 455,000 b/d in late 1986.

Gippsland crude is a light, sweet premium crude capable of producing very high yields of transport fuels with minimal refinery treatment (see assay) because atmospheric distillates to about 75 vol % of crude are obtainable. The intermediate, paraffinic-base crude contains moderate wax, but has a low viscosity.

The light straight run naphtha contains a high proportion of isoparaffins, making it a good gaso-

line base blendstock. The medium and heavy naphthas are good isomerization and reforming feeds because of high naphthenes and aromatics content. Sulfur content of the gas oils is less than 0.25 wt %, making it suitable for low-sulfur fuel oil, but better suited for catalytic cracking because of its low metals content.

Loading jetties for the crude are located at Long Island Point and Crib Point in Westernport Bay, about 100 km south of Melbourne in Victoria.

Each jetty can handle tankers up to 100,000 dwt, with pumping rates of 55,000 bbl/hr at Long Island, and 45,000 bbl/hr at Crib Point.

Barrow Island. The Barrow Island oil field, found in 1964, was the first oil discovery in Australia. The crude is named for the island on which it is produced, located off the northwest coast of Western Australia.

The field is operated by West Australian Petroleum Pty. Ltd. (Wapet). Wapet is a consortium of subsidiaries of Chevron Corp., Texaco Inc., and Royal Dutch Shell, each with a two-sevenths interest, and Ampol Exploration of Australia with a one-seventh interest.

Barrow Island crude is a sweet, moderately light crude with good yields of naphthas and middle distillates. Light gas oil and heavier cuts are low in sulfur and metals contents, making them suitable for low-sulfur fuel oil and catalytic cracking.

Barrow Island crude is loaded from a single buoy mooring (SBM) off Barrow Island and shipped to refining centers in Australia. Despite the fact that production has been declining from this mature field to about 15,000 b/d presently, with the changes in Australian regulations, some of the crude may still find its way to refineries around

the world.

Jabiru. The Jabiru oil field, named after a rare tropical northern Australian stork, is located in the Timor Sea frontier about 300 km off the Kimberly coast of Australia's Northern Territory, and about 680 km west of Darwin. Discovered in 1983, present production is about 13,500 b/d, but that is expected to be increased in the near future.

BHP Petroleum Pty. Ltd. is the operator of the field, holding a 50% interest, with the other participants: Ampol Exploration, 6.25%; Brenda Mines, 1.1%; Esso Exploration and Production, Australia, 18.75%; Norpac Securities, 1.1%; Norcen International 12.5%; and Peko Oil, 10.3%. BHP is also developing the nearby Chalis field.

Jabiru crude is somewhat less waxy than Gippsland crude, but has similar properties. It is an intermediate/paraffinic base classed crude with low sulfur and metals contents. Substantial yields of middle distillate make it a good crude for refiners that emphasize product slates in the middle distillate range. The low sulfur and metals contents of the resid make it suitable for direct feeding to catalytic crackers.

Crude is loaded through a floating production system (FPS) that contains processing equipment to stabilize the crude oil in Jabiru field (see Fig. 1 and cover photo). The FPS is the converted 140,000-dwt tanker Jabiru Venture. Total storage capacity is about 1 million bbl (OGJ, Sept. 7, 1987, pp. 53-58).

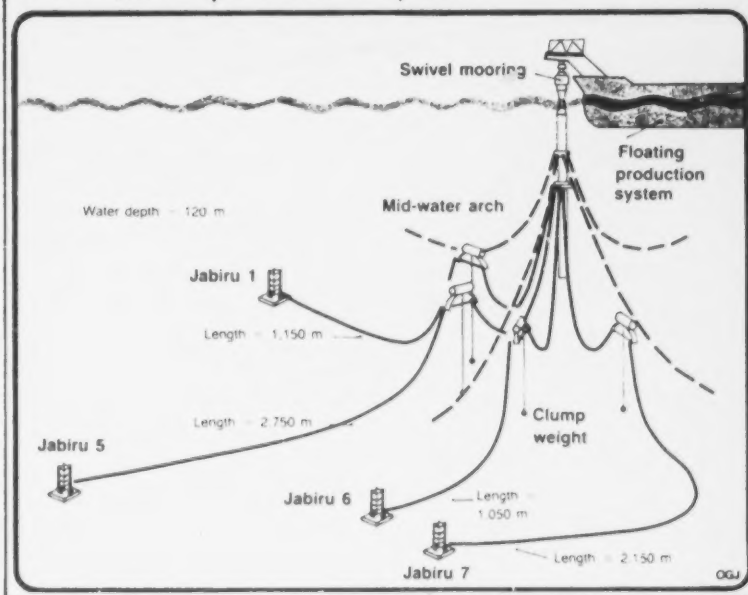
The loading system can handle vessels in the range of 25,000-150,000 dwt, and is able to deliver parcel sizes up to 770,000 bbl at flow rates to 20,000 bbl/hr.

Northwest Shelf condensate. The Northwest Shelf project, encompassing three major gas fields off the Pilbara coast of Western Australia and a world scale LNG plant now under construction, produces the high-quality Northwest Shelf condensate. The project, about 1,200 km north of Perth, produced about 8,000 b/d of condensate in 1986, and was expected to double that amount in early 1987.

Woodside Petroleum is the operator in a joint venture with BP Development Australia, California Asiatic Oil Co., Shell Development Australia, and BHP Petroleum Pty. Ltd.

The high API gravity condensate provides good yields (65-66 vol %) of naphthas and about 30 vol % middle distillates. The naphthas are suitable for reforming into gasoline blendstock or aromatic petrochemical feedstocks. Total sulfur content is very low at 70 ppm.

BHP's Jabiru production system



The first assay, conducted in November 1986, was completed on a sample with an Rvp of 6 psi. In January 1987, gas processing plant changes produced a condensate with an Rvp of 10 psi. Properties for the whole condensate are given for both the 6 and 10 psi Rvp streams (values in parentheses are for those properties that changed for the 10 psi Rvp stream; see assay). There were no significant differences observed in the density and other relevant properties in any fraction of the 10 psi Rvp condensate compared to the 6 psi Rvp condensate; therefore, 10 psi Rvp data are not included in the assay data for the fractions.

Northwest Shelf condensate is loaded from a dolphin berth in Withnell Bay. The berth can accommodate vessels from 19,500-130,000 dwt at loading rates to 18,000 bbl/hr.

Jackson blend. Jackson blend crude is supplied from the Cooper basin in southwestern Queensland. It is a blend of about 12 crudes from several oil fields producing in the area. Two of the participants in the field are Santos Ltd. and BHP Petroleum Pty. Ltd.

The crude is shipped via a 12-in., 495-mile pipeline completed in 1985, to Moonie in Queensland where it connects to an earlier-constructed pipeline to Brisbane. Initial flow was slated at 16,000 b/d, but the design of the line will allow up to 55,000 b/d. The line connects to the Ampol refinery at Lytton, near Brisbane.

Crude is loaded across the refinery

for export. Although none of the crude is being exported at present, it is highly possible that it will in the near future.

Crude oil assays with more information on the Australian crudes follow.

Key to the assays...

Each assay is headed, in the following order, by the official name of the crude, the former or secondary name in parenthesis, and location and type loading facilities. Loading systems that frequently crop up are abbreviated. Those used are CBM (conventional buoy mooring), SPM (single point mooring), SBM (single buoy mooring), CALM (catenary anchor leg mooring), and SALM (single anchor leg mooring).

Gippsland (Bass Strait)

Jetties at Long Island Point and Crib Point

Crude

Gravity, °API: 45.4

Density (α 15% C.): 0.7993

Total sulfur, wt %: 0.10

Salt, lb/1,000 bbl: 0.5

Rvp, psi: 5.1
Total N, wt %: 0.15
Pour pt, °C.: 15
Wax, wt %: 8.9
Vis. @ 21.1° C., cSt: 2.93
Vis. @ 37.8° C., cSt: 2.03
Acid no., mg KOH/g: 0.11

Naphtha

Range, °C.: 20-190
Yield, vol %: 39.3
Gravity, °API: 61.6
Density @ 15° C., kg/l.: 0.7327
Sulfur, wt %: 0.03
P/N/A, vol %: 59.1/32.5/8.4

Kerosine

Range, °C.: 190-230
Yield, vol %: 7.1
Gravity, °API: 44.9
Density @ 15° C., kg/l.: 0.8432
Sulfur, wt %: 0.06
Aromatics, vol %: 14.7
Pour pt, °C.: -43
Smoke pt, mm: 22
Aniline pt, °C.: 62.5
Cetane index: 44.7
Vis. @ 100° C., cSt: 1.44

Gas oil

Range, °C.: 230-340
Yield, vol %: 23.1
Gravity, °API: 36.2
Density @ 15° C., kg/l.: 0.8432
Sulfur, wt %: 0.08
Pour pt, °C.: -6
Cloud pt, °C.: -4
Cetane index: 51.7

Heavy gas oil

Range, °C.: 340-565
Yield, vol %: 27.4
Gravity, °API: 31.5
Density @ 15° C., kg/l.: 0.8678
Sulfur, wt %: 0.16
Wax, wt %: 35.6
Pour pt, °C.: 51
Aniline pt, °C.: 100.7
Rams. carbon, wt %: 0.3
Ni/V, ppm: 0.1/0.2
Vis. @ 100° C., cSt: 4.06

Residue

Range, °C.: 370+, 690+
Yield, vol %: 23.6
Gravity, °API: 30.4
Density @ 15° C., kg/l.: 0.8733
Sulfur, wt %: 0.22
Pour pt, °C.: 45
Ni/V, ppm: 0.3/0.6
Asphaltenes, wt %: 0.42

Barrow Island

SBM off Barrow Island

Crude

Gravity, °API: 36.8

Sulfur, wt %: 0.05
Kin. vis. @ 10° C., cSt: 3.40
Kin. vis. @ 100° C., cSt: 1.80
Pour pt, °C.: -30
Total acid no., mg KOH/g: 0.21

Gasoline

Range, °C.: C₅-65
Yield, vol %: 3.4
Density @ 15° C., kg/l.: 0.646
Sulfur, ppm: <50
RON clear: 78
P/N/A, vol %: 91/9/0

Light straight run

Range, °C.: 65-100
Yield, vol %: 7.7
Density @ 15° C., kg/l.: 0.728
Sulfur, ppm: <50
Ron clear: 70
P/N/A, vol %: 40/58/2

Naphtha

Range, °C.: 100-150
Yield, vol %: 14.4
Density @ 15° C., kg/l.: 0.759
Sulfur, ppm: <50
P/N/A, vol %: 46/47/7

Heavy naphtha

Range, °C.: 150-200
Yield, vol %: 15.5
Density @ 15° C., kg/l.: 0.803
Sulfur, wt %: 0.01
Aromatics, vol %: 12
Smoke pt, mm: 27
Freeze pt, °C.: < -60

Kerosine

Range, °C.: 200-250
Yield, vol %: 16.9
Density @ 15° C., kg/l.: 0.853
Kin. vis., @ 40° C., cSt: 1.67
Sulfur, wt %: 0.015
Cloud pt, °C.: -30
Aromatics, vol %: <20
Smoke pt, mm: 19
Freeze pt, °C.: < -60

Diesel

Range, °C.: 250-300
Yield, vol %: 14.6
Density @ 15° C., kg/l.: 0.886
Kin. vis. @ 48° C., cSt: 3.4
Sulfur, wt %: 0.02
Pour pt, °C.: < -30
Cloud pt, °C.: < -30
Cetane index: 36.5

Gas oil

Range, °C.: 300-350
Yield, vol %: 9.7
Density @ 15° C., kg/l.: 0.906
Kin. vis. @ 40° C., cSt: 8.11
Sulfur, wt %: 0.05
Pour pt, °C.: -30
Cloud Pt, °C.: -26

Cetane index: 41

Heavy gas oil

Range, °C.: 350-370
Yield, vol %: 2.7
Density @ 15° C., kg/l.: 0.922
Density @ 70° C., kg/l.: 0.884
Kin. vis. @ 40° C., cSt: 18.2
Sulfur, wt %: 0.09
Pour pt., °C.: -9
Cloud pt., °C.: -8

Residue

Range, °C.: 370+
Yield, vol %: 14.5
Density @ 15° C., kg/l.: 0.953
Density @ 70° C., kg/l.: 0.917
Kin. vis. @ 60° C., cSt: 63.9
Kin. vis. @ 100° C., cSt: 15.6
Sulfur, wt %: 0.16
Wax content, wt %: 3.5
Pour pt, °C.: 12
Acid no., mg KOH/g: 0.16
Asphaltenes, wt %: 0.2
Con. carbon, wt %: 3.2
V/Ni, ppm: 1/6

Jabiru

Floating production system in offshore producing area

Crude

Gravity, °API: 42.3
Total sulfur, wt %: 0.04
Salt, ppm: 38.6
Total N, wt %: 0.05
Rvp, psi: 4.5
UOP K: 11.9
Total acid no., mg KOH/g: 0.02
Asphaltenes, wt %: <0.05
Ni/V/Na, ppm: 3/0.1/11

Light naphtha

Range, °C.: 20-70
Yield, vol %: 3.9
Gravity, °API: 84.5
Density @ 15° C., kg/l.: 0.6551
Sulfur, wt %: 0.01
P/N/A, vol %: 87.7/11.9/0.4

Heavy naphtha

Range, °C.: 70-190
Yield, vol %: 23.0
Gravity, °API: 54.8
Density @ 15° C., kg/l.: 0.7593
Sulfur, wt %: 0.01
P/N/A, vol %: 49/38.2/12.8

Kerosine

Range, °C.: 150-230
Yield, vol %: 16.8
Gravity, °API: 47.3
Density @ 1° C., kg/l.: 0.7911
Sulfur, wt %: <0.01
Aromatics, vol %: 16.3

Freeze pt, °C.: -54
Smoke pt, mm: 25
Aniline pt, °C.: 58.4
Vis. @ 40° C., cSt: 1.13

Kerosine

Range, °C.: 190-230
Yield, vol %: 9.2
Gravity, °API: 44.5
Density @ 15° C., kg/l.: 0.8036
Sulfur, wt %: <0.001
Aromatics, vol %: 14.8
Freeze pt, °C.: -43
Smoke pt, mm: 25
Aniline pt, °C.: 63.0
Vis. @ 40° C., cSt: 1.36

Gas oil

Range, °C.: 230-360
Yield, vol %: 37.9
Gravity, °API: 37.5
Density @ 15° C., kg/l.: 0.8370
Sulfur, wt %: 0.02
Wax, wt %: 0.2
Pour pt, °C.: -3
Cloud pt, °C.: -2
Aniline pt, °C.: 75.0
Cetane index: 54.0
Vis. @ 100° C., cSt: 3.29

Heavy gas oil

Range, °C.: 360-540
Yield, vol %: 22.5
Gravity, °API: 30.8
Density @ 15° C., kg/l.: 0.8713
Sulfur, wt %: 0.10
Wax, wt %: 28.3
Pour pt., °C.: 39
Aniline pt, °C.: 97.8
Rams. carbon, wt %: 0.12
Ni/V ppm: 1.0/0.1
Asphaltenes, wt %: 0.08
Vis. @ 100° C., cSt: 4.05

Residue

Range, °C.: 360 +
Yield, vol %: 24.1
Gravity, °API: 29.4
Density @ 15° C., kg/l.: 0.8791
Sulfur, wt %: 0.12
Wax, wt %: 28.1
Pour pt, °C.: 39
Rams. carbon, wt %: 0.24
Ni/V, ppm: 2.2/0.2
Asphaltenes, wt %: 0.08
Vis. @ 100° C., cSt: 4.77

Residue

Range, °C.: 540 +
Yield, vol %: 1.6
Gravity, °API: 10.5
Density @ 15° C., kg/l.: 0.9962
Sulfur, wt %: 0.32
Pour pt, °C.: 51
Rams. carbon, wt %: 12.5
Ni/V, ppm: 29/2.7

Asphaltenes, wt %: 1.9
Vis. @ 100° C., cSt: 239.5

Northwest Shelf condensate

Dolphin berth in Withnell Bay

Whole condensate, 6 Rvp (10 Rvp)
Gravity, °API: 53.1 (55.8)
Density, @ 15° C., kg/l.: 0.7661 (0.7551)
Total sulfur, ppm: 102
Salt, mg/l.: 12.8
Rvp, psi: 6.1 (10.5)
Total N, wt %: 0.005
Pour pt, °C.: -36
Wax, wt %: <0.1
Vis. @ 20° C., cSt: 0.99 (0.90)
Vis. @ 40° C., cSt: 0.80 (0.73)
RON clear: 54.0 (58.6)
UOP K: 11.8 (11.6)
Total acid no., mg KOH/g: 0.02
Aromatics, vol %: 10.7 (10.8)
Ni/V, ppm: 0.2/<0.1
Na/Cu/Fe, ppm: 0.5/1.0/1.1

Gasoline

Range, °C.: C₅-70
Yield, vol %: 17.1
Gravity, °API: 85.9
Density @ 15° C., kg/l.: 0.6508
Sulfur, wt %: 0.004
n-paraffins, vol %: 46.0
i-paraffins, vol %: 43.2
Naphthenes, vol %: 9.5
Aromatics, vol %: 1.3

Naphtha

Range, °C.: 70-190
Yield, vol %: 50.3
Gravity, °API: 53.9
Density @ 15° C., kg/l.: 0.7630
Sulfur, wt %: 0.004
n-paraffins, vol %: 21.2
i-paraffins, vol %: 20.4
Aromatics, vol %: 16.8

Kerosine

Range, °C.: 150-230
Yield, vol %: 18.2
Gravity, °API: 44.2
Density @ 15° C., kg/l.: 0.8049
Sulfur, wt %: 0.02
Aromatics, vol %: 22.3
Freeze pt, °C.: -60
Smoke pt, mm: 21
Aniline pt, °C.: 48.6
Vis. @ 40° C., cSt: 1.06

Gas oil

Range, °C.: 190-230
Yield, vol %: 8.4
Gravity, °API: 42.0
Density @ 15° C., kg/l.: 0.8152
Sulfur, wt %: 0.01

Aromatics, vol %: 19.7
Freeze pt, °C.: -47
Smoke pt, mm: 21
Aniline pt, °C.: 54.8
Vis. @ 40° C., cSt: 1.06

Heavy gas oil

Range, °C.: 230-360
Yield, vol %: 18.7
Gravity, °API: 33.5
Density @ 15° C., kg/l.: 0.8570
Sulfur, wt %: 0.03
Wax, wt %: <0.1
Pour pt, °C.: -12
Cloud pt, °C.: -13
Aniline pt, °C.: 63.8
Cetane index: 45.1
Vis. @ 40° C., cSt: 3.02
Vis. @ 100° C., cSt: 1.24

Residue

Range, °C.: 360 +, 680 +
Yield, vol %: 2.7
Gravity, °API: 29.3
Density @ 15° C., kg/l.: 0.8794
Sulfur, wt %: 33.0
Pour pt, °C.: 30
Rams. carbon, wt %: 0.31
Ni/V, ppm: 0.6/<0.1
Asphaltenes, wt %: 0.26
Vis. @ 100° C., cSt: 3.63

Jackson blend

Loaded across Ampol refinery at Lytton

Crude

Gravity, °API: 41.9
Density @ 15° C., kg/l.: 0.8155
Sulfur, wt %: 0.03

Light straight run

Range, °C.: C₅-190
Yield, vol %: 16.5
RON clear: 25.9

Gas oil

Range, °C.: 190-230
Yield, vol %: 4.5
Aromatics, vol %: 7.0
Sulfur, wt %: 0.01

Heavy gas oil

Range, °C.: 230-320
Yield, vol %: 20.1
Sulfur, wt %: 0.02
Cloud pt, °C.: -1
Cetane index: 59.6

Residue

Range, °C.: 320 +
Yield, vol %: 58.5
Con. carbon, wt %: 0.9
Ni/V, ppm: 0.4/0.1
Rams. carbon, wt %: 0.7

Detailed assays conducted on Vietnamese crude oils

Pham Quang Du
Petro Viet Nam
Ho Chi Minh City

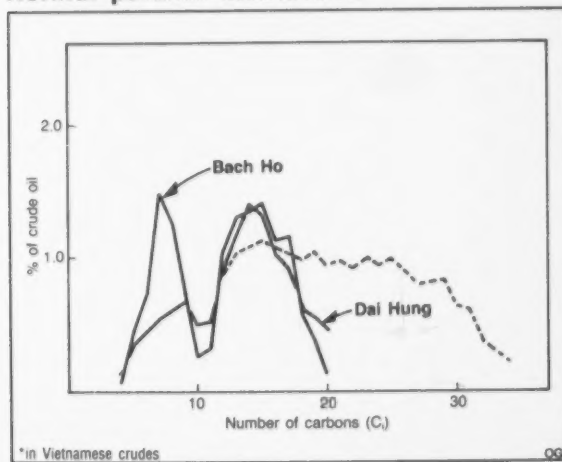
More oil property data, in the form of recent crude oil assays, have been made available for two Vietnamese

crude oils, Bach Ho (White Tiger) and Dai Hung (Big Bear).

Crude oil data presented earlier (OGJ, Nov. 6, 1989, p. 39) gave limited properties of the crudes, which are from the Miocene formations.

Fig. 1

Normal paraffin distribution*



Further analyses have been conducted on Bach Ho crude from the Oligocene formations. Production from Oligocene is far more representative of the oils produced from the Bach Ho field and marketed worldwide.

Currently, Bach Ho is the only producing field. Dai Hung is expected to be in production during the next few years.

Bach Ho is currently producing at the rate of 20,000 b/d. That figure is projected to grow to 100,000 b/d by 1992 and to 120,000 b/d by 1995.

Detailed assays of both crude oils are presented here.

Naphtha properties

A comparison of the naphtha cuts of both crude oils shows that the paraffin content, particularly of n-paraffin, of Dai Hung is much lower than that for Bach Ho (Table 1). But the aromatic content of Dai Hung is much higher than that for Bach Ho.

The difference between hydrocarbon group distributions of the naphtha cut compositions of Bach Ho and Dai Hung has a primary importance for gasoline-cut processing. Catalytic reforming of the gasoline cuts will be different for the two crudes.

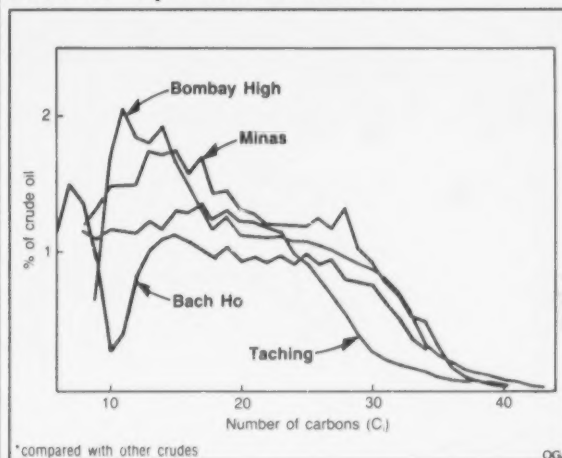
The distribution of hydrocarbon groups of the Vietnamese crudes, particularly the distribution of n-paraffins, also has a large effect on transportation and processing of these highly waxy crudes.

Fig. 1 shows the n-paraffin distribution of the two crude oils. It is clearly seen that for the naphtha cut, n-paraffin is higher for Dai Hung than for Bach Ho.

But for the diesel (gas oil) cut, the n-paraffin content (C_{12} - C_{18}) is similar for both crudes at about 9.5 wt %. With such a high n-paraffin content in the diesel cut, it is highly advisable to expect paraffin separation processing to decrease the pour point of the diesel and to supply the n-paraffins as raw material in petrochemical processing.

High-value petrochemical products could be: Sodium

Bach Ho n-paraffin distribution*



alkyl sulfonate, di-carboxylic acid, and cyclo pentadecanone.

Fig. 2 compares the paraffin distribution of the Vietnamese crude oils to the distributions of Taching (China), Minas (Indonesia), and Bombay High (India). Complete assays of these crudes can be found in OGJ, Sept. 5, 1983, pp. 144 and 148, and OGJ, Nov. 21, 1983, p. 78.

Although Minas, Taching, and Bombay High are of high paraffin contents and have similar pour points, their n-paraffin distributions are completely different (Table

2). This greatly affects pour-point depressant utilization.

For example, the IFP pour point depressant TPE101 used at 500 ppm can lower the pour point of Bombay High to 12° C. from 30° C., according to IFP. But the same depressant used at 3,000 ppm in Bach Ho, reduces the pour point to only 27° C. from 33° C.

However, two pour point depressants, Chem Link P-7599 and P-7590, used at 500 ppm are able to reduce the pour point of Bach Ho to 21° C. from 33° C., according to experiments at Vietsove-

rol in April by Chem Link.

The differences in the effects of the IFP and Chem Link depressants when they are applied to Vietnamese crude oils show different mechanisms of action of chemicals on the n-paraffin distribution of the crudes.

In conclusion, the study of hydrocarbon group distribution, particularly the n-paraffin distribution in Vietnamese crude oils, has an important practical importance in the selection of the proper additives for transportation and production, but also for determination of processing orientation in view of obtaining high-value raw materials for petrochemicals production.

Bach Ho (White Tiger) Viet Nam

Floating storage in South China Sea southeast of Ho Chi Minh City.

Crude

Gravity, °API: 38.6
Sulfur, wt %: 0.03-0.05
Pour pt., °C.: 33
Vis, cSt @ 40° C.: 9.72
Vis, cSt @ 50° C.: 6.59
Vis, cSt @ 60° C.: 4.73
Concarbon residue, wt %: 0.65-1.08
Asphaltenes, wt %: 0.05
Wax, wt %: 27
Rvp @ 100° F., psi: 2.5
V/Ni, ppm: 2/2
Nitrogen, wt %: 0.067
Salt as NaCl, mg/l.: 22
C₄ & lighter, vol %: 0.15
Acid No., mgKOH/g: 0.05

Light naphtha (C₅-95° C.)

Yield on crude, vol %: 2.3
Density @ 15° C., kg/l.: 0.683
Sulfur, wt %: 0.001
Mercaptan sulfur, wt %: 0.0002
Paraffins, wt %: 75.2
Naphthenes, wt %: 18.4
Aromatics, wt %: 6.4
n-paraffins, wt %: 42.0

Light naphtha (C₅-149° C.)

Yield on crude, vol %: 10.1
Density @ 15° C., kg/l.: 0.729
Sulfur, wt %: 0.001
Mercaptan sulfur, wt %: 0.0002
Paraffins, wt %: 60.5
Naphthenes, wt %: 31.3
Aromatics, wt %: 8.2
n-paraffins, wt %: 34.9

Heavy naphtha (95-175° C.)

Yield on crude, vol %: 12.3
Density @ 15° C., kg/l.: 0.7505
Sulfur, wt %: 0.001

Paraffins and aromatics contents of naphtha cuts

n-paraffin content	Dai Hung	Bach Ho
Light naphtha cut (C ₅ - 90° C.)	21.4 %	42.0 %
(C ₅ - 149° C.) cut	14.7 %	34.9 %
Heavy naphtha cut (C ₅ - 175° C.)	13.5 %	33.7 %
Aromatic content	Dai Hung	Bach Ho
C ₅ - 90° C.	19.7 %	6.4 %
C ₅ - 149° C.	35.6 %	8.2 %
95 - 175° C.	43.0 %	9.8 %

Waxy crude comparison

No	Crude	Wax, %	Pour point, °C.
1	Bach Ho	26-27	33
2	Taching	16.1	36
3	Minas	18.7	36
4	Bombay High	11	30

Mercaptan sulfur, wt %: 0.0002
Paraffins, wt %: 59.0
Naphthenes, wt %: 31.2
Aromatics, wt %: 9.8
n-paraffins, wt %: 33.7

Kerosine (149-232° C.)
Yield on crude, vol %: 14.35
Density @ 15° C., kg/l.: 0.7785
Sulfur, wt %: 0.001
Mercaptan sulfur, wt %: 0.0002
Vis., cSt @ 40° C.: 1.12
Vis., cSt @ 60° C.: 0.88
Acid No., mgKOH/g: 0.041
Aromatics, vol %: 13.0
Smoke pt., mm: 35
Freeze pt., °C.: -49.0

Gas oil (232-342° C.)
Yield on crude, vol %: 23.05
Density @ 15° C., kg/l.: 0.818
Sulfur, wt %: 0.016
Vis., cSt @ 50° C.: 2.67
Vis., cSt @ 80° C.: 1.30
Cloud pt., °C.: -3
Pour pt., °C.: -3
Wax, wt %: 9.5
Total nitrogen, ppm wt: 26
Acid No., mgKOH/g: 0.01
Aniline pt., °C.: 65.8
Cetane index: 47.6

Residue (342° C. +)
Yield on crude, vol %: 52.35
Density @ 15° C., kg/l.: 0.868
Sulfur, wt %: 0.04
Vis., cSt @ 50° C.: 29.6
Pour pt., °C.: 51
Wax, wt %: 49
Total nitrogen, ppm: 590
Concarbon residue, wt %: 1.2
Asphaltenes, wt %: 0.05
V/Ni, ppm wt: 2/2

Residue (369° C. +)
Yield on crude, vol %: 46.75
Density @ 15° C., kg/l.: 0.872
Sulfur, wt %: 0.045
Vis., cSt @ 50° C.: 37.9
Vis., cSt @ 60° C.: 26.6
Vis., cSt @ 80° C.: 14.8
Vis., cSt @ 100° C.: 9.21
Pour pt., °C.: 54
Wax, wt %: 50
Total nitrogen, ppm: 640
Acid No., mgKOH/g: 0.05
Concarbon residue, wt %: 1.3
Asphaltenes, wt %: 0.05
V/Ni, ppm wt: 2/2
Saturates, wt %: 75
Aromatics, wt %: 21
Resins A, wt %: 4

Residue (509° C. +)
Yield on crude, vol %: 17.8
Density @ 15° C., kg/l.: 0.9045
Sulfur, wt %: 0.065
Vis., cSt @ 100° C.: 32
Vis., cSt @ 120° C.: 19.6
Wax, wt %: 47
Total nitrogen, ppm: 1,210
Concarbon residue, wt %: 3.10
Asphaltenes, wt %: 0.05
V/Ni, ppm wt: 2/2

Residue (550° C. +)
Yield on crude, vol %: 14.2
Density @ 15° C., kg/l.: 0.9045
Sulfur, wt %: 0.065

The author...



Du

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Vis., cSt @ 100° C.: 42.9
Vis., cSt @ 120° C.: 25.7
Vis., cSt @ 150° C.: 13.9
Penetration @ 25° C., mm/10: 214
Softening pt., °C.: 56
Total nitrogen, ppm: 1,350
Concarbon residue, wt %: 3.6
Asphaltenes, wt %: 0.05
V/Ni, ppm wt: 2/2
Saturates, wt %: 58
Aromatics, wt %: 15
Resins A, wt %: 6
Resins B, wt %: 21

Dai Hung (Big Bear)

Not yet in production

Crude
Gravity, °API: 36.9

Sulfur, wt %: 0.08
Pour pt., °C.: 27
Vis., cSt @ 40° C.: 3.61
Vis., cSt @ 50° C.: 2.94
Vis., cSt @ 60° C.: 2.94
Concarbon residue, wt %: 0.70
Asphaltenes, wt %: 0.07
Wax, wt %: 26
V/Ni, ppm: 2/2
Nitrogen, wt %: 0.028
C₄ & lighter, vol %: 0.90
Acid No., mgKOH/g: 0.27

Light naphtha (C₅-95° C.)
Yield on crude, vol %: 5.55
Density @ 15° C., kg/l.: 0.7185
Sulfur, wt %: 0.001
Mercaptan sulfur, wt %: 0.0002
Paraffins, wt %: 51.5
Naphthenes, wt %: 28.9
Aromatics, wt %: 19.7
n-paraffins, wt %: 21.4

Light naphtha (C₅-149° C.)
Yield on crude, vol %: 17.8
Density @ 15° C., kg/l.: 0.7685
Sulfur, wt %: 0.002
Mercaptan sulfur, wt %: 0.0002
Paraffins, wt %: 33.6
Naphthenes, wt %: 30.8
Aromatics, wt %: 35.6
n-paraffins, wt %: 14.7

Heavy naphtha (95-175° C.)
Yield on crude, vol %: 17.1
Density @ 15° C., kg/l.: 0.7955
Sulfur, wt %: 0.003
Mercaptan sulfur, wt %: 0.0002
Paraffins, wt %: 29.5
Naphthenes, wt %: 27.5
Aromatics, wt %: 43.0
n-paraffins, wt %: 13.5

Kerosine (149-232° C.)
Yield on crude, vol %: 14.7
Density @ 15° C., kg/l.: 0.8155
Sulfur, wt %: 0.007
Mercaptan sulfur, wt %: 0.0002
Vis., cSt @ 40° C.: 1.08
Vis., cSt @ 60° C.: 0.89
Acid No., mgKOH/g: 0.143
Aromatics, vol %: 32.7
Smoke pt., mm: 17
Freeze pt., °C.: -54.5

Gas oil (232-342° C.)
Yield on crude, vol %: 27.15
Density @ 15° C., kg/l.: 0.852

Sulfur, wt %: 0.068
Vis., cSt @ 50° C.: 2.61
Vis., cSt @ 80° C.: 1.26
Cloud pt., °C.: -2
Pour pt., °C.: -3
Wax, wt %: 9.5
Total nitrogen, ppm wt: 24
Acid No., mgKOH/g: 0.21
Aniline pt., °C.: 68.7
Cetane index: 48.8

Residue (342° C. +)
Yield on crude, vol %: 39.45
Density @ 15° C., kg/l.: 0.8775
Sulfur, wt %: 0.12
Pour pt., °C.: 54
Wax, wt %: 54
Total nitrogen, ppm: 490
Concarbon residue, wt %: 1.7
Asphaltenes, wt %: 0.16
V/Ni, ppm wt: 2/2

Residue (369° C. +)
Yield on crude, vol %: 33.65
Density @ 15° C., kg/l.: 0.8815
Sulfur, wt %: 0.12
Pour pt., °C.: 57
Wax, wt %: 55
Total nitrogen, ppm: 550
Acid No., mgKOH/g: 0.23
Concarbon residue, wt %: 2.0
Asphaltenes, wt %: 0.19
V/Ni, ppm wt: 2/2
Saturates, wt %: 85
Aromatics, wt %: 9
Resins A, wt %: 2
Resins B, wt %: 4

Residue (509° C. +)
Yield on crude, vol %: 7.0
Density @ 15° C., kg/l.: 0.9675
Sulfur, wt %: 0.27
Vis., cSt @ 100° C.: 77.7
Vis., cSt @ 120° C.: 39.8
Penetration @ 25° C., mm/10: 51
Softening pt., °C.: 59.5
Wax, wt %: 38
Total nitrogen, ppm: 1,600
Concarbon residue, wt %: 8.4
Asphaltenes, wt %: 0.85
V/Ni, ppm wt: 2/11

Residue (550° C. +)
Yield on crude, vol %: 5.0
Density @ 15° C., kg/l.: 0.9895
Sulfur, wt %: 0.31
Vis., cSt @ 100° C.: 220
Vis., cSt @ 120° C.: 96.1
Vis., cSt @ 150° C.: 36.7
Penetration @ 25° C., mm/10: 31
Softening pt., °C.: 60.5
Total nitrogen, ppm: 1,900
Concarbon residue, wt %: 11.5
Asphaltenes, wt %: 1.1
V/Ni, ppm wt: 2/15
Saturates, wt %: 15
Aromatics, wt %: 53
Resins A, wt %: 24
Resins B, wt %: 8

Acknowledgment

The author thanks J.P. Durand of IFP and his colleagues for their permission to use the n-paraffin distribution data on the crude oils used in the comparisons.

Baker Hughes rig count

	1-28-91	1-29-90
Alabama	10	14
Alaska	12	10
Arkansas	10	9
California	64	40
Land	60	34
Offshore	4	6
Colorado	22	23
Florida	1	4
Illinois	4	4
Indiana	0	0
Kansas	51	46
Kentucky	10	8
Louisiana	141	139
N. Land	11	19
S. Inland Waters	26	19
S. Land	37	36
Offshore	67	66
Maryland	0	0
Michigan	13	17
Mississippi	16	14
Montana	8	2
Nebraska	3	3
New Mexico	51	43
New York	3	1
North Dakota	24	18
Ohio	10	18
Oklahoma	114	121
Pennsylvania	28	15

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	1-28-91	1-29-90
South Dakota	0	1
Texas	408	320
Offshore	11	22
Inland Waters	0	0
Dist. 1	67	34
Dist. 2	27	11
Dist. 3	52	34
Dist. 4	37	38
Dist. 5	9	19
Dist. 6	25	34
Dist. 7B	12	16
Dist. 7C	29	20
Dist. 8	57	45
Dist. 8A	48	21
Dist. 9	19	20
Dist. 10	15	6
Utah	4	2
West Virginia	9	20
Wyoming	31	40
Others, HI - 1, NV - 2		
VA - 1	4	5
Total U.S.	1,051	937
Cum. Avg. to Date	1,071	998
Canada	225	205
Canada-Offshore	1	0
Grand Total	1,277	1,142

Oil Rigs - 639 Gas Rigs - 396
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	2-25-91	2-26-90
Alabama	9	10
Alaska	14	11
Arkansas	10	6
California	53	38
Land	49	34
Offshore	4	4
Colorado	17	26
Florida	3	3
Illinois	4	4
Indiana	0	0
Kansas	42	44
Kentucky	8	7
Louisiana	134	148
N. Land	16	18
S. Inland Waters	19	17
S. Land	33	39
Offshore	66	74
Maryland	0	0
Michigan	11	13
Mississippi	12	4
Montana	3	2
Nebraska	3	2
New Mexico	42	35
New York	3	1
North Dakota	18	18
Ohio	11	17
Oklahoma	122	111
Pennsylvania	31	15

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	2-25-91	2-26-90
South Dakota	0	0
Texas	371	328
Offshore	11	22
Inland Waters	0	0
Dist. 1	72	43
Dist. 2	22	9
Dist. 3	60	36
Dist. 4	39	41
Dist. 5	11	18
Dist. 6	28	39
Dist. 7B	4	23
Dist. 7C	25	20
Dist. 8	42	42
Dist. 8A	31	21
Dist. 9	16	14
Dist. 10	10	10
Utah	8	3
West Virginia	11	10
Wyoming	24	26
Others, HI - 2, VA - 1		
Total U.S.	967	897
Cum. Avg. to Date	1,032	959
Canada	233	230
Canada-Offshore	1	0
Grand Total	1,201	1,127

Oil Rigs - 555 Gas Rigs - 397
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	3-25-91	3-26-90
Alabama	11	16
Alaska	14	15
Arkansas	10	9
California	56	35
Land	53	32
Offshore	3	3
Colorado	18	24
Florida	0	2
Illinois	4	4
Indiana	0	0
Kansas	39	43
Kentucky	5	7
Louisiana	122	138
N. Land	16	17
S. Inland Waters	16	12
S. Land	33	39
Offshore	59	70
Maryland	0	0
Michigan	3	15
Mississippi	8	11
Montana	4	2
Nebraska	3	1
New Mexico	42	33
New York	2	1
North Dakota	18	20
Ohio	10	13
Oklahoma	119	106
Pennsylvania	20	18

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	3-25-91	3-26-90
South Dakota	0	0
Texas	350	333
Offshore	10	24
Inland Waters	0	1
Dist. 1	64	48
Dist. 2	19	11
Dist. 3	62	36
Dist. 4	39	46
Dist. 5	12	13
Dist. 6	30	36
Dist. 7B	10	15
Dist. 7C	22	19
Dist. 8	39	43
Dist. 8A	25	18
Dist. 9	10	12
Dist. 10	7	11
Utah	8	4
West Virginia	9	15
Wyoming	31	23
Others, HI - 1, NV - 2		
TN - 1, VA - 1	5	5
Total U.S.	911	893
Cum. Avg. to Date	1,000	942
Canada	194	189
Canada-Offshore	1	1
Grand Total	1,106	1,083

Oil Rigs - 503 Gas Rigs - 389
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	4-26-91	4-27-90
Alabama	13	21
Alaska	11	11
Arkansas	7	14
California	59	42
Land	50	33
Offshore	3	3
Colorado	20	20
Florida	0	2
Illinois	4	4
Indiana	1	0
Kansas	35	53
Kentucky	8	7
Louisiana	141	146
N. Land	18	16
S. Inland Waters	20	18
S. Land	31	37
Offshore	72	75
Maryland	0	0
Michigan	6	10
Mississippi	3	11
Montana	3	0
Nebraska	3	0
New Mexico	27	45
New York	1	0
North Dakota	8	20
Ohio	7	5
Oklahoma	108	119
Pennsylvania	6	8

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	4-26-91	4-27-90
South Dakota	1	0
Texas	304	336
Offshore	14	27
Inland Waters	0	1
Dist. 1	55	48
Dist. 2	10	9
Dist. 3	54	39
Dist. 4	36	42
Dist. 5	11	15
Dist. 6	23	34
Dist. 7B	11	8
Dist. 7C	17	17
Dist. 8	30	35
Dist. 8A	21	31
Dist. 9	13	9
Dist. 10	8	9
Utah	11	5
West Virginia	8	14
Wyoming	27	22
Others, HI - 1, NV - 2		
TN - 1, VA - 1	5	7
Total U.S.	824	927
Cum. Avg. to Date	955	934
Canada	41	52
Canada-Offshore	1	0
Grand Total	866	979

Oil Rigs - 444 Gas Rigs - 347
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	5-24-91	5-25-90
Alabama	11	26
Alaska	12	9
Arkansas	12	7
California	54	58
Land	50	55
Offshore	4	3
Colorado	24	29
Florida	0	2
Illinois	4	4
Indiana	0	0
Kansas	35	50
Kentucky	9	12
Louisiana	116	165
N. Land	9	19
S. Inland Waters	20	22
S. Land	28	44
Offshore	59	80
Maryland	0	0
Michigan	7	15
Mississippi	9	12
Montana	2	2
Nebraska	4	2
New Mexico	36	50
New York	6	0
North Dakota	9	25
Ohio	10	10
Oklahoma	101	117
Pennsylvania	13	10

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	5-24-91	5-25-90
South Dakota	0	0
Texas	319	342
Offshore	21	25
Inland Waters	2	0
Dist. 1	50	59
Dist. 2	18	8
Dist. 3	56	31
Dist. 4	39	40
Dist. 5	9	13
Dist. 6	25	39
Dist. 7B	8	9
Dist. 7C	18	20
Dist. 8	29	39
Dist. 8A	25	29
Dist. 9	9	11
Dist. 10	10	10
Utah	8	3
West Virginia	11	12
Wyoming	27	34
Others, HI - 1, NV - 4		
TN - 1, VA - 1	7	6
Total U.S.	846	1,001
Cum. Avg. to Date	929	939
Canada	74	64
Canada-Offshore	1	1
Grand Total	921	1,066

Oil Rigs - 451 Gas Rigs - 361
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	6-21-91	6-22-90
Alabama	12	33
Alaska	11	10
Arkansas	8	6
California	52	47
Land	48	43
Offshore	4	4
Colorado	28	31
Florida	0	2
Illinois	4	4
Indiana	0	0
Kansas	27	48
Kentucky	9	8
Louisiana	124	166
N. Land	9	24
S. Inland Waters	17	21
S. Land	39	36
Offshore	59	85
Maryland	0	0
Michigan	10	16
Mississippi	6	15
Montana	2	5
Nebraska	2	0
New Mexico	35	51
New York	3	0
North Dakota	15	22
Ohio	13	11
Oklahoma	97	127
Pennsylvania	16	18

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	6-21-91	6-22-90
South Dakota	0	1
Texas	323	333
Offshore	17	20
Inland Waters	3	1
Dist. 1	44	60
Dist. 2	21	8
Dist. 3	58	28
Dist. 4	42	46
Dist. 5	10	11
Dist. 6	27	36
Dist. 7B	4	10
Dist. 7C	11	24
Dist. 8	33	38
Dist. 8A	28	31
Dist. 9	13	14
Dist. 10	12	6
Utah	10	3
West Virginia	14	17
Wyoming	33	37
Others, HI - 2, NV - 2		
TN - 1, VA - 1	6	6
Total U.S.	886	1,021
Cum. Avg. to Date	917	949
Canada	87	94
Canada-Offshore	1	0
Grand Total	954	1,115

Oil Rigs - 485 Gas Rigs - 340
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	7-26-91	7-27-90
Alabama	11	30
Alaska	11	10
Arkansas	7	10
California	51	52
Land	46	47
Offshore	5	5
Colorado	34	36
Florida	1	2
Illinois	4	4
Indiana	0	0
Kansas	36	42
Kentucky	4	11
Louisiana	106	140
N. Land	13	14
S. Inland Waters	12	20
S. Land	34	30
Offshore	47	76
Maryland	0	0
Michigan	10	15
Mississippi	9	16
Montana	7	6
Nebraska	2	3
New Mexico	33	48
New York	3	3
North Dakota	14	20
Ohio	18	14
Oklahoma	103	134
Pennsylvania	13	15

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	7-26-91	7-27-90
South Dakota	1	0
Texas	292	322
Offshore	9	16
Inland Waters	1	1
Dist. 1	33	89
Dist. 2	10	11
Dist. 3	59	39
Dist. 4	34	44
Dist. 5	11	11
Dist. 6	38	31
Dist. 7B	7	11
Dist. 7C	15	11
Dist. 8	30	34
Dist. 8A	20	19
Dist. 9	14	15
Dist. 10	11	10
Utah	14	6
West Virginia	17	15
Wyoming	39	37
Others, HI - 2, NV - 1		
TN - 1, VA - 1	5	5
Total U.S.	845	996
Cum. Avg. to Date	906	959
Canada	100	122
Canada-Offshore	2	0
Grand Total	947	1,118

Oil Rigs - 470 Gas Rigs - 329
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	8-30-91	8-31-90
Alabama	13	35
Alaska	11	11
Arkansas	11	12
California	46	59
Land	43	54
Offshore	3	5
Colorado	34	28
Florida	0	2
Illinois	4	4
Indiana	0	0
Kansas	28	44
Kentucky	5	8
Louisiana	101	143
N. Land	11	19
S. Inland Waters	11	18
S. Land	30	31
Offshore	49	75
Maryland	0	0
Michigan	3	8
Mississippi	6	14
Montana	2	3
Nebraska	31	43
New Mexico	1	2
New York	9	22
North Dakota	9	22
Ohio	95	159
Oklahoma	20	22
Pennsylvania		

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	8-30-91	8-31-90
South Dakota	1	1
Texas	283	338
Offshore	16	21
Inland Waters	0	2
Dist. 1	35	69
Dist. 2	14	10
Dist. 3	48	36
Dist. 4	26	47
Dist. 5	8	12
Dist. 6	37	32
Dist. 7B	9	10
Dist. 7C	19	16
Dist. 8	30	29
Dist. 8A	19	27
Dist. 9	13	14
Dist. 10	9	13
Utah	13	10
West Virginia	19	11
Wyoming	36	48
Others, HI - 2, NV - 2		
VA - 1	5	3
Total U.S.	799	1,012
Cum. Avg. to Date	891	963
Canada	98	104
Canada-Offshore	1	0
Grand Total	898	1,116

Oil Rigs - 423 Gas Rigs - 339
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	9-27-91	9-28-90
Alabama	6	38
Alaska	7	12
Arkansas	42	13
California	39	55
Land	3	4
Offshore	40	37
Colorado	1	2
Florida	4	4
Illinois	0	0
Indiana	34	44
Kansas	6	6
Kentucky	91	138
Louisiana	6	12
N. Land	11	19
S. Inland Waters	24	36
S. Land	50	71
Offshore	0	0
Maryland	3	11
Michigan	11	7
Mississippi	3	2
Montana	36	58
Nebraska	0	1
New Mexico	12	21
New York	17	13
North Dakota	26	124
Ohio	23	20
Oklahoma		
Pennsylvania		

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	9-27-91	9-28-90
South Dakota	2	0
Texas	264	356
Offshore	15	1
Inland Waters	27	70
Dist. 1	8	10
Dist. 2	58	33
Dist. 3	23	49
Dist. 4	9	16
Dist. 5	37	32
Dist. 7B	7	12
Dist. 7C	16	19
Dist. 8	24	48
Dist. 8A	15	22
Dist. 9	11	15
Dist. 10	13	11
Utah	13	9
West Virginia	17	17
Wyoming	28	41
Others, HI - 1, NV - 3		
VA - 2	6	6
Total U.S.	775	1,047
Cum. Avg. to Date	879	972
Canada	100	102
Canada-Offshore	1	0
Grand Total	876	1,149

Oil Rigs - 438 Gas Rigs - 306
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	11-29-91	11-30-90
Alabama	9	32
Alaska	9	12
Arkansas	8	14
California	31	57
Land	28	55
Offshore	3	2
Colorado	30	41
Florida	4	4
Illinois	0	0
Indiana	0	0
Kansas	30	52
Kentucky	5	6
Louisiana	101	158
N. Land	6	21
S. Inland Waters	16	26
S. Land	27	34
Offshore	52	77
Maryland	0	0
Michigan	8	10
Mississippi	9	9
Montana	1	3
Nebraska	45	68
New Mexico	2	1
New York	15	23
North Dakota	15	10
Ohio	92	153
Oklahoma	18	20
Pennsylvania	0	0
South Dakota	312	418
Texas	19	21
Offshore	0	1
Inland Waters	22	88
Dist. 1	9	11
Dist. 2	64	44
Dist. 3	28	42
Dist. 4	12	11
Dist. 5	36	30
Dist. 6	7	11
Dist. 7B	26	27
Dist. 7C	42	58
Dist. 8	23	47
Dist. 8A	11	16
Dist. 9	13	11
Dist. 10	16	7
Utah	17	23
West Virginia	23	39
Wyoming		
Others, NV - 4	9	5
VA - 4, WA - 1		
Total U.S.	822	1,175
Cum. Avg. to Date	865	999
Canada	105	189
Canada-Offshore	0	0
Grand Total	927	1,364

Oil Rigs - 484 Gas Rigs - 321
Rotary rigs from spudding in to total depth.

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

BAKER HUGHES RIG COUNT

	12-27-91	12-28-90
Alabama	9	22
Alaska	4	13
Arkansas	6	12
California	29	47
Land	26	43
Offshore	3	4
Colorado	36	29
Florida	0	1
Illinois	4	4
Indiana	0	0
Kansas	32	60
Kentucky	6	8
Louisiana	85	148
N. Land	6	15
S. Inland Waters	11	28
S. Land	24	33
Offshore	44	72
Maryland	0	0
Michigan	8	14
Mississippi	8	12
Montana	3	9
Nebraska	4	3
New Mexico	37	74
New York	1	4
North Dakota	13	19
Ohio	13	10
Oklahoma	84	128
Pennsylvania	17	11
South Dakota	0	2
Texas	306	391
Offshore	11	18
Inland Waters	1	1
Dist. 1	20	73
Dist. 2	14	24
Dist. 3	72	51
Dist. 4	32	37
Dist. 5	6	10
Dist. 6	25	23
Dist. 7B	7	9
Dist. 7C	24	22
Dist. 8	42	53
Dist. 8A	30	43
Dist. 9	11	14
Dist. 10	11	13
Utah	14	8
West Virginia	16	18
Wyoming	26	36
Others, NV - 5, VA - 4		
Total U.S.	770	1,008
Cum. Avg. to Date	859	1,006
Canada	78	147
Canada-Offshore	0	0
Grand Total	848	1,233

Oil Rigs - 433 Gas Rigs - 316
Rotary rigs from spudding in to total depth.

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Baker Hughes rig count

	10-25-91	10-26-90
Alabama	9	31
Alaska	6	11
Arkansas	15	16
California	39	52
Land	36	49
Offshore	3	3
Colorado	37	43
Florida	0	2
Illinois	4	4
Indiana	0	0
Kansas	32	45
Kentucky	5	11
Louisiana	85	156
N. Land	9	23
S. Inland Waters	12	26
S. Land	19	35
Offshore	45	72
Maryland	0	0
Michigan	11	9
Mississippi	6	10
Montana	2	3
Nebraska	34	72
New Mexico	0	0
New York	10	13
North Dakota	18	12
Ohio	118	141
Oklahoma	20	23
Pennsylvania		

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

	10-25-91	10-26-90
South Dakota	0	0
Texas	279	375
Offshore	16	21
Inland Waters	0	2
Dist. 1	21	75
Dist. 2	15	10
Dist. 3	59	35
Dist. 4	28	35
Dist. 5	6	10
Dist. 6	33	35
Dist. 7B	8	9
Dist. 7C	27	29
Dist. 8	24	54
Dist. 8A	19	32
Dist. 9	12	20
Dist. 10	11	8
Utah	17	5
West Virginia	11	18
Wyoming	30	44
Others, NV - 4, VA - 4		
Total U.S.	801	1,107
Cum. Avg. to Date	871	982
Canada	90	143
Canada-Offshore	0	0
Grand Total	891	1,250

Oil Rigs - 432 Gas Rigs - 341
Rotary rigs from spudding in to total depth

Smith rig count

Proposed depth (feet)	1-25-91		1-26-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	40	35.0	38	47.4
2,501-5,000	146	80.1	129	84.5
5,001-7,500	195	77.9	166	71.1
7,501-10,000	313	37.7	256	54.7
10,001-12,500	170	41.2	189	32.8
12,501-15,000	138	18.8	116	32.8
15,001-17,500	63	11.1	66	30.3
17,501-20,000	24	20.8	23	21.7
20,001-over	16	12.5	6	—
Total	1,195	48.3	989	51.6

INLAND 29 24
LAND 972 835
OFFSHORE 104 130

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	4-26-91		4-27-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	35	22.9	45	33.3
2,501-5,000	113	78.8	176	75.6
5,001-7,500	133	73.7	161	68.9
7,501-10,000	236	38.6	306	42.5
10,001-12,500	166	32.5	157	37.6
12,501-15,000	100	20.0	120	34.2
15,001-17,500	58	13.8	67	22.4
17,501-20,000	32	21.9	36	30.6
20,001-over	17	17.6	9	—
Total	890	42.5	1,077	47.8

INLAND 21 24
LAND 751 919
OFFSHORE 118 134

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	7-26-91		7-27-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	45	44.4	55	47.3
2,501-5,000	140	80.0	204	72.1
5,001-7,500	158	76.6	156	78.2
7,501-10,000	246	50.0	297	43.8
10,001-12,500	127	41.7	169	47.3
12,501-15,000	122	32.0	130	27.7
15,001-17,500	50	18.0	72	12.5
17,501-20,000	25	8.0	30	23.3
20,001-over	15	13.3	9	—
Total	928	51.8	1,122	49.6

INLAND 17 23
LAND 832 990
OFFSHORE 79 109

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	10-25-91		10-26-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	34	47.1	50	34.0
2,501-5,000	144	83.3	246	75.6
5,001-7,500	163	73.6	227	76.7
7,501-10,000	214	57.9	342	42.4
10,001-12,500	144	41.0	221	44.3
12,501-15,000	96	39.6	154	24.0
15,001-17,500	31	19.4	66	18.2
17,501-20,000	23	17.4	24	16.7
20,001-over	10	—	12	—
Total	859	56.7	1,342	50.1

INLAND 14 29
LAND 759 1,188
OFFSHORE 76 125

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	2-22-91		2-23-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	43	44.2	33	42.4
2,501-5,000	129	79.8	161	76.4
5,001-7,500	188	75.5	165	77.0
7,501-10,000	285	43.2	244	47.5
10,001-12,500	190	33.7	172	38.4
12,501-15,000	122	17.2	114	28.1
15,001-17,500	68	13.2	69	18.8
17,501-20,000	24	16.7	21	23.8
20,001-over	17	11.8	8	—
Total	1,066	45.7	987	50.3

INLAND 26 24
LAND 937 835
OFFSHORE 103 128

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	5-17-91		5-18-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	34	29.4	42	47.6
2,501-5,000	119	84.9	182	67.6
5,001-7,500	128	68.0	166	73.5
7,501-10,000	232	43.1	304	43.8
10,001-12,500	143	29.4	173	39.9
12,501-15,000	110	17.3	118	26.8
15,001-17,500	54	11.1	78	17.9
17,501-20,000	32	18.8	34	32.4
20,001-over	18	16.7	9	—
Total	870	43.0	1,106	47.6

INLAND 21 23
LAND 735 942
OFFSHORE 114 141

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	8-30-91		8-31-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	28	35.7	44	45.5
2,501-5,000	127	88.2	227	75.3
5,001-7,500	167	76.0	207	74.4
7,501-10,000	221	52.5	304	43.1
10,001-12,500	125	47.2	198	41.4
12,501-15,000	120	36.7	128	25.8
15,001-17,500	40	22.5	69	21.7
17,501-20,000	21	14.3	28	17.9
20,001-over	13	7.7	11	9.1
Total	862	55.8	1,216	50.3

INLAND 15 23
LAND 765 1,065
OFFSHORE 82 128

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (ft)	11-29-91		11-30-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	19	31.6	48	47.9
2,501-5,000	131	81.7	247	79.4
5,001-7,500	174	79.3	225	72.0
7,501-10,000	223	53.4	346	44.8
10,001-12,500	130	45.4	211	40.8
12,501-15,000	108	36.1	158	20.9
15,001-17,500	41	34.1	75	20.0
17,501-20,000	18	27.8	24	20.8
20,001-over	6	—	13	7.7
Total	859	57.3	1,347	50.2

INLAND 16 34
LAND 765 1,186
OFFSHORE 69 127

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	3-15-91		3-16-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	30	30.0	33	36.4
2,501-5,000	109	81.7	166	77.1
5,001-7,500	167	76.0	148	79.1
7,501-10,000	276	46.0	266	48.1
10,001-12,500	186	34.9	175	38.3
12,501-15,000	105	14.3	130	35.4
15,001-17,500	67	16.4	61	8.2
17,501-20,000	29	24.1	23	30.4
20,001-over	15	13.3	8	—
Total	984	45.9	1,010	50.5

INLAND 23 24
LAND 858 851
OFFSHORE 103 135

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	6-21-91		6-22-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	40	40.0	41	51.2
2,501-5,000	117	87.2	210	72.9
5,001-7,500	174	74.7	191	73.8
7,501-10,000	238	45.0	320	44.1
10,001-12,500	143	37.8	170	44.7
12,501-15,000	116	24.1	114	30.7
15,001-17,500	51	17.6	70	20.0
17,501-20,000	30	16.7	36	25.0
20,001-over	15	13.3	9	—
Total	924	49.0	1,161	50.8

INLAND 15 22
LAND 804 1,020
OFFSHORE 105 119

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

Smith rig count

Proposed depth (feet)	9-27-91		9-28-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	33	39.4	35	22.9
2,501-5,000	139	84.9	235	77.0
5,001-7,500	156	76.9	218	73.4
7,501-10,000	203	55.2	340	40.6
10,001-12,500	145	42.8	200	36.5
12,501-15,000	96	37.5	139	24.5
15,001-17,500	36	13.9	57	19.3
17,501-20,000	23	13.0	24	16.7
20,001-over	13	7.7	11	—
Total	844	55.7	1,259	48.4

INLAND 15 25
LAND 754 1,116
OFFSHORE 75 118

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

SMITH RIG COUNT

Proposed depth (ft)	12-27-91		12-28-90	
	Rig count	% footage*	Rig count	% footage*
0-2,500	17	35.3	35	31.4
2,501-5,000	95	84.2	161	82.6
5,001-7,500	135	80.7	165	69.7
7,501-10,000	189	53.4	334	42.2
10,001-12,500	129	43.4	201	34.8
12,501-15,000	121	31.4	144	22.2
15,001-17,500	38	34.2	66	18.2
17,501-20,000	17	23.5	26	15.4
20,001-over	5	—	14	7.1
Total	746	54.6	1,146	45.3

INLAND 9 29
LAND 664 1,010
OFFSHORE 73 107

* Rigs employed under footage contracts.
Definitions, see OGI 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Data-
base.

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
1-25-91*	1-26-90†	1-25-91*	1-26-90†
Alabama	50	52	53
Alaska	1,930	1,884	184
California	952	971	100
Colorado	79	80	298
Florida	14	19	1,874
Illinois	54	56	76
Kansas	148	154	77
Louisiana	1,040	1,068	284
Michigan	53	57	120
Mississippi	72	73	135
Total	7,351	7,512	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
3-22-91*	3-23-90†	3-22-91*	3-23-90†
Alabama	50	52	53
Alaska	1,935	1,822	184
California	964	968	101
Colorado	80	82	300
Florida	14	17	1,905
Illinois	54	54	74
Kansas	146	148	77
Louisiana	1,050	1,036	287
Michigan	53	55	120
Mississippi	72	73	129
Total	7,436	7,390	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
5-24-91*	5-25-90†	5-24-91*	5-25-90†
Alabama	51	52	52
Alaska	1,815	1,766	185
California	965	965	101
Colorado	80	84	305
Florida	14	17	1,940
Illinois	52	53	73
Kansas	146	148	77
Louisiana	1,060	1,009	279
Michigan	52	55	119
Mississippi	73	73	114
Total	7,364	7,204	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
7-26-91*	7-27-90†	7-26-91*	7-27-90†
Alabama	52	49	54
Alaska	1,810	1,687	190
California	955	952	101
Colorado	78	83	303
Florida	14	15	1,950
Illinois	52	57	72
Kansas	152	150	74
Louisiana	1,070	1,060	277
Michigan	53	53	119
Mississippi	73	73	117
Total	7,375	7,173	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
9-27-91*	9-28-90†	9-27-91*	9-28-90†
Alabama	49	52	54
Alaska	1,845	1,702	186
California	954	954	101
Colorado	79	84	301
Florida	11	13	1,955
Illinois	49	54	72
Kansas	153	151	74
Louisiana	1,070	1,054	279
Michigan	51	52	118
Mississippi	73	74	125
Total	7,383	7,224	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
10-25-91*	10-26-90†	10-25-91*	10-26-90†
Alabama	49	52	54
Alaska	1,880	1,884	185
California	955	968	99
Colorado	81	84	101
Florida	10	13	290
Illinois	49	55	1,950
Kansas	155	162	72
Louisiana	1,075	1,087	74
Michigan	50	54	274
Mississippi	73	74	286
Total	7,415	7,542	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
2-22-91*	2-23-90†	2-22-91*	2-23-90†
Alabama	50	52	53
Alaska	1,950	1,834	185
California	955	962	100
Colorado	79	80	101
Florida	15	20	278
Illinois	57	58	279
Kansas	146	147	1,885
Louisiana	1,055	1,058	76
Michigan	53	55	79
Mississippi	72	73	282
Total	7,416	7,396	125

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
4-26-91*	4-27-90†	4-26-91*	4-27-90†
Alabama	51	52	54
Alaska	1,820	1,803	183
California	968	968	101
Colorado	81	82	305
Florida	14	16	1,935
Illinois	53	53	76
Kansas	149	149	74
Louisiana	1,060	1,049	284
Michigan	52	54	122
Mississippi	74	76	124
Total	7,379	7,319	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
6-21-91*	6-22-90†	6-21-91*	6-22-90†
Alabama	53	50	53
Alaska	1,730	1,644	192
California	960	962	101
Colorado	79	82	100
Florida	13	16	308
Illinois	54	54	293
Kansas	149	147	1,945
Louisiana	1,065	1,018	72
Michigan	53	53	76
Mississippi	73	74	279
Total	7,337	7,120	284

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
8-30-91*	8-31-90†	8-30-91*	8-31-90†
Alabama	49	49	54
Alaska	1,815	1,727	189
California	952	951	100
Colorado	79	82	100
Florida	12	13	300
Illinois	50	57	317
Kansas	153	158	1,965
Louisiana	1,069	1,067	1,913
Michigan	52	53	72
Mississippi	73	76	74
Total	7,388	7,287	281

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate (1,000 b/d)			
11-29-91*	11-30-90†	11-29-91*	11-30-90†
Alabama	49	47	54
Alaska	1,800	1,746	189
California	978	968	100
Colorado	82	84	95
Florida	10	14	79
Illinois	50	56	10
Kansas	155	157	15
Louisiana	1,073	1,074	49
Michigan	50	54	47
Mississippi	72	75	153
Montana	52	55	1,082
New Mexico	185	189	1,074
North Dakota	99	102	51
Oklahoma	287	313	53
Texas	1,932	1,967	72
Utah	69	75	76
Wyoming	270	286	52
All others	114	125	185
Total	7,332	7,387	98

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ PRODUCTION REPORT

Crude oil and lease condensate (1,000 b/d)			
12-27-91*	12-28-90†	12-27-91*	12-28-90†
Alabama	48	51	51
Alaska	1,880	1,838	185
California	965	948	100
Colorado	79	78	100
Florida	10	15	286
Illinois	49	47	1,930
Kansas	153	145	68
Louisiana	1,082	1,074	269
Michigan	51	53	118
Mississippi	72	76	118
Montana	52	52	276
New Mexico	185	185	276
North Dakota	98	100	118
Oklahoma	286	277	
Texas	1,930	1,933	
Utah	68	72	
Wyoming	269	276	
All others	118	118	
Total	7,416	7,338	

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

API refinery report—January 25, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude stills	Operable capacity	% operated	Motor gasoline		Jet fuel	Fuel oils			
						Total	Loaded*	Unloaded*	Naphtha	Kero	Distillate	Residual
East coast	1,171	1,005	1,036	1,384	74.9	591	3	588	4	85	280	167
App. Dist. 1	106	100	100	124	80.6	37	2	35	—	—	29	5
Dist. 1 total	1,277	1,105	1,136	1,508	76.3	628	5	623	4	85	309	172
Ind., Ill., Ky.	2,073	1,909	1,933	2,250	85.9	1,121	4	1,117	2	119	422	73
Minn., Wis., Dak.	330	323	325	343	94.8	198	2	196	1	17	90	8
Okla., Kan., Mo.	703	572	589	737	79.9	347	10	337	1	49	148	5
Dist. 2 total	3,106	2,804	2,847	3,330	85.5	1,666	16	1,650	4	185	660	86
Inland Texas	535	479	500	584	85.6	332	16	316	15	46	116	16
Texas Gulf coast	3,173	2,734	2,768	3,339	82.9	1,470	3	1,467	71	280	566	215
La. Gulf Coast	2,551	2,396	2,403	2,911	82.5	1,095	9	1,086	12	370	518	163
N. La. and Ark.	197	183	183	257	71.2	65	3	62	7	—	55	11
New Mexico	82	69	70	78	89.7	40	3	32	11	1	17	1
Dist. 3 total	6,538	5,881	5,824	7,189	82.8	3,002	39	2,963	118	687	1,272	498
Dist. 4 total	428	401	414	556	74.5	230	43	187	8	35	112	7
Dist. 5 total	2,589	2,487	2,558	3,091	82.8	1,124	142	982	39	409	445	292
January 25, 1991	13,338	12,658	12,879	15,654	82.3	6,650	245	6,405	171	1,411	2,798	963
January 18, 1991†	13,883	12,585	12,774	15,654	81.6	6,548	298	6,250	143	1,315	2,842	923
January 26, 1990	15,105	13,702	13,850	15,604	88.8	7,048	450	6,598	189	1,375	3,051	1,198

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—February 22, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude stills	Operable capacity	% operated	Motor gasoline		Jet fuel	Fuel oils			
						Total	Loaded*	Unloaded*	Naphtha	Kero	Distillate	Residual
East coast	1,319	1,185	1,185	1,384	85.6	564	8	556	16	59	376	139
App. Dist. 1	102	97	98	124	79.0	52	2	50	—	—	25	3
Dist. 1 total	1,421	1,282	1,283	1,508	85.1	616	10	606	16	59	401	142
Ind., Ill., Ky.	2,063	1,925	1,925	2,250	85.6	1,114	2	1,112	5	105	434	62
Minn., Wis., Dak.	344	330	331	343	96.5	176	2	174	1	15	83	5
Okla., Kan., Mo.	776	674	684	737	92.8	369	2	367	2	44	176	3
Dist. 2 total	3,183	2,929	2,940	3,330	88.3	1,659	6	1,653	8	164	693	70
Inland Texas	526	487	487	554	83.4	266	17	249	14	28	104	14
Texas Gulf coast	3,153	2,791	2,796	3,339	83.7	1,337	23	1,314	58	299	634	225
La. Gulf Coast	2,495	2,403	2,410	2,911	82.8	1,096	21	1,075	12	333	514	124
N. La. and Ark.	177	166	166	257	64.6	60	3	57	4	1	54	10
New Mexico	72	71	71	78	91.0	32	11	21	10	1	15	1
Dist. 3 total	6,423	5,918	5,930	7,189	82.7	2,791	75	2,716	98	662	1,321	374
Dist. 4 total	443	424	427	556	76.8	224	49	175	11	26	121	7
Dist. 5 total	2,609	2,513	2,591	3,091	83.8	1,169	124	1,045	41	380	404	356
February 22, 1991	14,139	13,058	13,171	15,654	84.1	6,459	264	6,195	174	1,291	2,940	949
February 15, 1991†	14,185	12,978	13,171	15,654	84.1	6,625	267	6,358	168	1,345	2,828	1,060
February 23, 1990	14,608	13,458	13,629	15,614	87.3	6,754	347	6,407	205	1,289	2,698	1,003

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—March 23, 1990

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude stills	Operable capacity	% operated	Motor gasoline		Jet fuel	Fuel oils			
						Total	Loaded*	Unloaded*	Naphtha	Kero	Distillate	Residual
East coast	1,294	1,153	1,154	1,325	87.1	541	1	540	17	85	276	121
App. Dist. 1	106	97	97	124	78.2	32	2	30	6	—	31	2
Dist. 1 total	1,400	1,250	1,251	1,449	88.3	573	3	570	23	85	307	123
Ind., Ill., Ky.	2,096	1,902	1,902	2,198	86.5	1,127	9	1,118	—	161	396	46
Minn., Wis., Dak.	331	320	320	337	95.0	162	12	150	—	12	84	6
Okla., Kan., Mo.	620	576	603	730	82.6	343	30	313	15	28	153	4
Dist. 2 total	3,047	2,798	2,825	3,286	86.5	1,632	51	1,581	18	201	633	56
Inland Texas	577	509	512	568	90.1	323	28	295	26	40	120	14
Texas Gulf coast	3,212	2,719	2,746	3,477	79.0	1,517	—	1,517	29	259	508	206
La. Gulf Coast	2,303	2,214	2,255	2,936	76.8	956	42	914	9	273	473	128
N. La. and Ark.	189	183	183	247	74.1	53	—	53	8	4	48	7
New Mexico	76	69	70	76	92.1	41	11	30	11	3	14	1
Dist. 3 total	6,357	5,694	5,766	7,306	78.9	2,890	61	2,809	83	679	1,163	356
Dist. 4 total	479	415	418	546	76.8	226	56	176	11	32	118	10
Dist. 5 total	2,805	2,748	2,805	3,048	92.0	1,158	151	1,087	61	388	398	411
March 23, 1990	14,088	12,905	13,065	15,614	83.7	6,479	336	6,143	193	1,286	2,615	956
March 16, 1990†	13,939	12,841	13,068	15,614	83.7	6,421	387	6,034	199	1,248	2,537	1,015
March 24, 1989	14,188	12,748	12,938	15,907	81.3	6,442	855	5,587	224	1,178	2,679	951

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—April 26, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	Input to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,309	1,124	1,144	1,384	82.7	607	16	591	2	82	298	140
App. Dist. 1	46	38	38	124	30.6	12	1	11	—	—	12	2
Dist. 1 total	1,355	1,162	1,182	1,508	78.4	619	17	602	2	82	310	142
Ind., Ill., Ky.	2,123	2,044	2,051	2,250	91.2	1,109	2	1,107	6	104	423	62
Minn., Wis., Dak.	238	237	237	343	69.1	109	4	105	4	25	53	7
Okla., Kan., Mo.	778	731	734	737	99.6	375	2	373	11	31	229	4
Dist. 2 total	3,139	3,012	3,022	3,330	90.8	1,593	8	1,585	21	160	705	73
Inland Texas	423	409	409	584	70.0	268	—	267	22	9	97	10
Texas Gulf coast	3,171	2,624	2,629	3,339	78.7	1,576	—	1,576	41	209	540	182
La. Gulf Coast	2,546	2,418	2,465	2,930	84.1	1,099	21	1,078	14	292	531	118
N. La. and Ark.	189	183	185	257	72.0	51	—	51	8	7	51	11
New Mexico	81	77	77	78	98.7	48	11	37	9	2	18	2
Dist. 3 total	6,410	5,738	5,765	7,188	80.2	3,042	33	3,009	94	519	1,237	323
Dist. 4 total	475	440	445	556	80.0	222	44	178	16	29	124	17
Dist. 5 total	2,915	2,705	2,793	3,091	90.4	1,254	150	1,104	48	335	426	321
April 26, 1991	14,294	13,057	13,207	15,573	84.3	6,730	252	6,478	181	1,125	2,804	876
April 19, 1991†	14,110	12,987	13,134	15,554	83.9	6,761	288	6,473	121	1,156	2,769	878
April 27, 1990	13,879	12,980	13,087	15,614	83.8	6,811	373	6,538	178	1,155	2,808	845

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—May 17, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	Input to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,417	1,180	1,191	1,384	86.1	678	6	672	5	79	267	177
App. Dist. 1	101	98	99	124	79.8	35	4	31	—	—	24	1
Dist. 1 total	1,518	1,278	1,290	1,508	85.5	713	10	703	5	79	291	178
Ind., Ill., Ky.	2,486	2,087	2,103	2,250	93.5	1,140	3	1,137	10	122	470	57
Minn., Wis., Dak.	358	352	354	343	103.2	144	2	142	2	28	88	13
Okla., Kan., Mo.	800	733	733	737	99.5	415	16	399	3	42	217	5
Dist. 2 total	3,644	3,172	3,190	3,330	95.8	1,699	21	1,678	15	192	775	75
Inland Texas	503	500	501	584	85.8	293	12	281	19	37	118	16
Texas Gulf coast	3,421	2,958	2,966	3,339	88.8	1,581	3	1,578	46	297	601	211
La. Gulf Coast	2,226	2,101	2,134	2,930	72.8	1,150	35	1,115	13	244	434	129
N. La. and Ark.	148	131	141	257	54.9	53	—	53	1	11	37	10
New Mexico	66	64	65	78	83.3	43	8	35	7	1	15	3
Dist. 3 total	6,364	5,754	5,807	7,188	80.8	3,120	58	3,062	88	590	1,205	369
Dist. 4 total	487	472	473	556	85.1	236	34	202	18	15	132	8
Dist. 5 total	2,794	2,688	2,771	3,091	89.6	1,251	174	1,077	48	382	488	310
May 17, 1991	14,807	13,364	13,531	15,573	86.3	7,019	297	6,722	172	1,178	2,812	940
May 10, 1991†	14,610	13,522	13,642	15,573	87.0	7,011	249	6,762	164	1,200	2,916	926
May 18, 1990	13,926	13,155	13,270	15,614	85.0	6,800	343	6,257	214	1,188	2,742	889

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—June 21, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	Input to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,485	1,269	1,285	1,384	92.8	747	14	733	2	81	361	128
App. Dist. 1	108	105	106	124	85.5	43	3	40	—	—	36	4
Dist. 1 total	1,593	1,374	1,391	1,508	92.2	790	17	773	2	81	397	132
Ind., Ill., Ky.	2,131	2,130	2,130	2,250	94.7	1,147	4	1,143	13	131	404	81
Minn., Wis., Dak.	345	340	344	343	100.3	195	3	192	3	20	29	10
Okla., Kan., Mo.	775	732	733	737	99.5	410	14	396	6	43	206	6
Dist. 2 total	3,251	3,202	3,207	3,330	96.3	1,752	21	1,731	22	194	639	97
Inland Texas	617	597	598	584	102.4	295	11	284	22	46	137	27
Texas Gulf coast	3,469	3,010	3,013	3,339	90.2	1,573	6	1,567	31	250	589	236
La. Gulf Coast	2,486	2,303	2,341	2,930	79.9	1,160	24	1,136	27	293	477	134
N. La. and Ark.	188	186	187	257	72.8	61	—	61	4	7	55	13
New Mexico	79	77	78	78	100.0	45	6	39	9	2	17	2
Dist. 3 total	6,839	6,173	6,217	7,188	86.5	3,134	47	3,087	93	588	1,275	412
Dist. 4 total	517	494	503	556	90.5	264	44	220	12	28	135	10
Dist. 5 total	2,932	2,768	2,908	3,091	94.1	1,384	155	1,229	44	374	444	307
June 21, 1991	15,132	14,011	14,227	15,573	90.8	7,334	284	7,050	173	1,275	2,890	958
June 14, 1991†	15,484	14,001	14,165	15,573	90.4	7,538	304	7,234	189	1,257	3,041	973
June 22, 1990	14,615	13,485	13,595	15,614	87.6	7,119	372	6,747	133	1,152	2,978	908

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—July 26, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Loaded*	Unloaded*	Naphtha	Kero	Distillate	Residual
East coast	1,451	1,253	1,253	1,378	90.9	642	9	633	7	98	313	115
App. Dist. 1	103	103	103	130	79.2	37	3	34	—	—	39	4
Dist. 1 total	1,554	1,356	1,356	1,508	89.9	679	12	667	7	98	352	119
Ind., Ill., Ky.	2,167	2,135	2,144	2,235	95.9	1,167	2	1,165	13	127	432	74
Minn., Wis., Dak.	324	323	323	358	90.2	159	5	154	1	18	78	17
Okla., Kan., Mo.	773	735	735	747	98.4	431	11	420	1	40	204	7
Dist. 2 total	3,264	3,193	3,202	3,340	95.9	1,757	18	1,739	15	185	714	98
Inland Texas	556	521	522	598	87.3	303	12	291	17	34	124	22
Texas Gulf coast	3,311	2,940	2,940	3,370	87.2	1,681	1	1,680	41	286	629	200
La. Gulf Coast	2,576	2,405	2,418	2,944	82.1	1,174	28	1,146	22	267	475	146
N. La. and Ark.	191	190	190	241	78.8	66	—	66	5	4	54	13
New Mexico	81	75	76	82	92.7	45	9	36	8	2	19	1
Dist. 3 total	6,715	6,131	6,146	7,235	84.9	3,269	50	3,219	93	593	1,301	382
Dist. 4 total	497	496	498	557	89.4	253	47	206	13	17	149	8
Dist. 5 total	2,844	2,666	2,754	3,068	89.8	1,393	184	1,209	48	343	451	288
July 26, 1991	14,874	13,842	13,956	15,708	88.8	7,351	311	7,040	176	1,236	2,967	895
July 19, 1991†	14,801	13,798	13,949	15,708	88.8	7,208	256	6,952	134	1,226	3,067	890
July 27, 1990	15,571	14,361	14,536	15,516	93.7	7,431	375	7,056	151	1,298	3,076	1,040

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—August 30, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Loaded*	Unloaded*	Naphtha	Kero	Distillate	Residual
East coast	1,531	1,273	1,301	1,378	94.4	772	—	772	4	88	345	115
App. Dist. 1	115	102	103	130	79.2	43	3	40	—	—	38	4
Dist. 1 total	1,646	1,375	1,404	1,508	93.1	815	3	812	4	88	383	119
Ind., Ill., Ky.	2,143	2,082	2,082	2,235	93.2	1,145	7	1,138	15	150	402	74
Minn., Wis., Dak.	345	341	342	358	95.5	204	4	200	—	—	100	6
Okla., Kan., Mo.	778	738	738	747	98.8	427	7	420	10	37	197	8
Dist. 2 total	3,266	3,161	3,162	3,340	94.7	1,776	18	1,758	25	203	699	88
Inland Texas	631	532	533	598	89.1	316	8	308	18	43	117	15
Texas Gulf Coast	3,467	3,051	3,051	3,370	90.5	1,665	—	1,665	39	322	590	276
La. Gulf Coast	2,590	2,423	2,425	2,944	82.4	1,175	6	1,169	17	237	649	113
N. La. and Ark.	212	200	200	241	83.0	66	—	66	5	9	55	14
New Mexico	88	79	80	82	97.6	50	12	38	9	1	17	1
Dist. 3 total	6,988	6,285	6,289	7,235	86.9	3,272	26	3,246	88	612	1,428	419
Dist. 4 total	542	518	518	557	93.0	278	58	220	12	31	145	11
Dist. 5 total	2,943	2,760	2,843	3,068	92.7	1,298	170	1,128	55	400	445	341
August 30, 1991	15,385	14,099	14,216	15,708	90.5	7,439	275	7,164	184	1,334	3,100	978
August 23, 1991	15,224	13,873	14,005	15,708	89.2	7,234	266	6,968	159	1,304	3,001	972
August 31, 1990	15,116	14,176	14,276	15,516	92.0	7,320	412	6,908	180	1,266	3,058	972

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—September 27, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Loaded*	Unloaded*	Naphtha	Kero	Distillate	Residual
East coast	1,508	1,183	1,183	1,378	85.8	704	8	696	8	79	366	142
App. Dist. 1	114	97	99	130	76.2	66	3	63	—	—	39	4
Dist. 1 total	1,622	1,280	1,282	1,508	85.0	770	11	759	8	79	405	146
Ind., Ill., Ky.	2,286	2,137	2,180	2,235	97.5	1,240	6	1,234	22	131	439	59
Minn., Wis., Dak.	325	309	313	358	87.4	164	3	161	2	29	72	7
Okla., Kan., Mo.	806	748	758	747	101.5	393	6	387	10	41	201	6
Dist. 2 total	3,419	3,194	3,251	3,340	97.3	1,797	15	1,782	34	201	712	72
Inland Texas	659	531	543	598	90.8	326	17	309	22	54	131	17
Texas Gulf coast	3,286	2,889	2,921	3,370	86.7	1,477	13	1,464	56	288	626	213
La. Gulf Coast	2,315	2,226	2,230	2,944	75.7	1,083	—	1,083	14	26	630	82
N. La. and Ark.	186	170	173	241	71.8	50	—	50	4	7	50	14
New Mexico	97	78	79	82	96.3	48	6	42	8	1	19	2
Dist. 3 total	6,543	5,894	5,946	7,235	82.2	2,984	36	2,948	104	612	1,456	328
Dist. 4 total	492	466	467	557	83.8	247	47	200	16	29	119	12
Dist. 5 total	2,823	2,668	2,764	3,068	90.1	1,249	148	1,101	25	373	463	287
September 27, 1991	14,899	13,502	13,710	15,708	87.3	7,047	257	6,790	187	1,294	3,155	845
September 20, 1991†	15,041	13,860	13,985	15,708	89.0	7,013	286	6,727	157	1,318	3,138	847
September 28, 1990	15,240	13,962	14,145	15,591	90.7	7,327	371	6,956	189	1,319	2,955	961

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—October 25, 1991

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,203	880	894	1,378	64.9	596	13	583	7	75	273	86
App. Dist. 1	83	77	78	130	60.0	22	2	20	—	—	25	—
Dist. 1 total	1,286	957	972	1,508	64.5	618	15	603	7	75	298	86
Ind., Ill., Ky.	2,063	1,826	1,826	2,235	81.7	1,179	—	1,179	22	95	461	76
Minn., Wis., Dak.	323	313	313	358	87.4	148	2	146	3	18	90	13
Okla., Kan., Mo.	769	712	715	747	95.7	358	—	358	3	35	192	4
Dist. 2 total	3,155	2,851	2,854	3,340	85.4	1,685	2	1,683	28	148	743	93
Inland Texas	558	447	471	598	78.8	301	13	288	8	45	122	—
Texas Gulf coast	3,454	2,845	2,845	3,370	84.4	1,543	31	1,512	63	339	707	235
La. Gulf Coast	2,556	2,408	2,434	2,944	82.7	1,155	6	1,149	18	297	544	117
N. La. and Ark.	137	135	136	241	56.4	40	—	40	6	5	34	4
New Mexico	79	77	78	82	95.1	47	10	37	6	1	20	1
Dist. 3 total	6,784	5,912	5,964	7,235	82.4	3,086	69	3,026	101	687	1,427	357
Dist. 4 total	501	487	493	557	88.5	246	42	204	12	36	131	14
Dist. 5 total	2,513	2,491	2,512	3,068	81.9	1,218	126	1,092	23	322	416	213
October 25, 1991	14,239	12,698	12,795	15,708	81.5	6,853	245	6,608	171	1,268	3,015	763
October 18, 1991†	14,256	12,994	13,087	15,708	83.3	6,916	246	6,670	132	1,275	2,940	786
October 26, 1990	14,257	12,604	12,868	15,591	82.5	6,758	409	6,349	170	1,396	2,937	746

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—November 29, 1991

District	REFINERY OPERATIONS					REFINERY OUTPUT						
	Total refinery input	Crude runs	to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,263	1,079	1,096	1,378	79.5	612	17	595	11	104	361	123
App. Dist. 1	105	95	103	130	79.2	39	2	37	—	—	38	2
Dist. 1 total	1,368	1,174	1,199	1,508	79.5	651	19	632	11	104	399	125
Ind., Ill., Ky.	2,070	1,886	1,889	2,235	84.5	1,144	1	1,143	6	132	416	118
Minn., Wis., Dak.	357	344	346	358	96.6	186	—	186	1	20	96	12
Okla., Kan., Mo.	781	700	701	747	93.8	413	5	408	12	73	200	7
Dist. 2 total	3,208	2,930	2,936	3,340	87.9	1,743	6	1,737	19	225	712	137
Inland Texas	582	502	520	598	87.0	297	19	278	18	39	115	18
Texas Gulf coast	3,443	2,862	2,863	3,370	85.0	1,563	11	1,552	44	306	638	217
La. Gulf Coast	2,590	2,303	2,357	2,944	80.1	1,249	29	1,220	11	285	736	182
N. La. and Ark.	161	156	156	241	64.7	43	—	43	6	4	45	11
New Mexico	77	67	74	82	90.2	49	9	40	3	1	10	11
Dist. 3 total	6,853	5,890	5,970	7,235	82.5	3,201	68	3,133	82	635	1,544	439
Dist. 4 total	435	430	434	557	77.9	231	35	196	11	31	112	6
Dist. 5 total	2,709	2,527	2,635	3,068	85.9	1,211	58	1,153	52	347	458	266
November 29, 1991	14,573	12,951	13,174	15,708	83.9	7,037	186	6,851	175	1,342	3,225	973
November 22, 1991†	14,611	13,239	13,426	15,708	85.5	7,134	170	6,964	134	1,356	3,137	842
November 30, 1990	14,905	13,489	13,714	15,591	88.0	7,299	288	7,011	209	1,480	3,085	859

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API REFINERY REPORT—DECEMBER 20, 1991

District	REFINERY OPERATIONS					REFINERY OUTPUT						
	Total refinery input	Crude runs	to crude still	Operable capacity	% operated	Motor gasoline			Jet fuel		Fuel oils	
						Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,432	1,149	1,154	1,378	83.7	654	7	647	8	73	338	219
App. Dist. 1	93	87	91	130	70.0	39	2	37	—	—	36	3
Dist. 1 total	1,525	1,236	1,245	1,508	82.8	693	9	684	8	73	374	222
Ind., Ill., Ky.	2,291	2,148	2,167	2,235	97.0	1,345	—	1,345	14	129	478	109
Minn., Wis., Dak.	329	318	325	358	90.8	191	—	191	—	24	80	9
Okla., Kan., Mo.	710	671	679	747	90.9	436	—	436	11	39	191	8
Dist. 2 total	3,330	3,137	3,171	3,340	94.9	1,972	—	1,972	25	192	749	126
Inland Texas	516	466	475	598	79.4	306	19	287	27	45	155	18
Texas Gulf coast	3,568	2,937	3,009	3,370	89.3	1,574	—	1,574	30	370	673	257
La. Gulf Coast	2,525	2,409	2,438	2,944	82.8	1,200	9	1,191	15	294	538	136
N. La. and Ark.	193	186	189	241	78.4	53	—	53	5	1	57	13
New Mexico	73	65	72	82	87.8	49	8	41	7	—	18	3
Dist. 3 total	6,875	6,063	6,183	7,235	85.5	3,182	36	3,146	84	710	1,441	429
Dist. 4 total	399	397	398	557	71.5	224	29	195	13	29	107	12
Dist. 5 total	2,759	2,635	2,685	3,068	87.5	1,362	71	1,291	37	424	437	338
December 20, 1991	14,888	13,468	13,682	15,708	87.1	7,433	145	7,288	167	1,428	3,108	1,127
December 13, 1991†	15,293	13,434	13,670	15,708	87.0	7,221	170	7,051	150	1,347	3,172	1,009
December 21, 1990	14,343	12,856	13,072	15,591	83.8	7,091	281	6,810	167	1,425	2,925	1,014

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API crude and product stocks

(Thousands of barrels)										
	Crude oil	Motor gasoline			Blending Comp.†	Jet fuels		Fuel oils		Unfinished oils
		Total	Leaded†	Unleaded†		Naphtha	Kerosine	Distillate	Residual	
PAD I	13,991	62,867	89	57,710	5,068	518	12,171	44,904	24,565	12,052
PAD II	67,379	54,924	2,400	44,949	7,575	855	9,105	29,348	3,229	13,729
PAD III	154,274	63,375	793	47,682	14,900	2,182	16,073	26,518	15,161	47,570
PAD IV	11,967	7,619	1,347	3,674	2,598	256	787	3,017	443	1,844
PAD I-IV.....	247,611	188,785	4,629	154,015	30,141	3,811	38,136	103,787	43,398	75,195
PAD V	76,816*	32,164	5,143	18,650	8,371	1,831	6,999	11,596	6,281	25,953
January 25, 1991	324,427*	220,949	9,772	172,665	38,512	5,642	45,135	115,383	49,679	101,148
January 18, 1991§	321,259	217,681	9,679	169,688	38,314	5,478	45,261	119,007	48,631	100,732
January 26, 1990	343,366	226,764	16,807	171,002	38,955	6,523	36,742	116,504	47,795	105,643

*Includes 18,868 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
	Crude oil	Motor gasoline				Jet fuels		Fuel oils		Unfinished oils
		Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	
PAD I	16,091	61,569	54	55,974	5,541	840	11,432	35,031	20,337	10,371
PAD II	69,800	59,525	1,853	49,933	7,739	888	9,112	30,211	3,719	13,699
PAD III	157,552	64,988	723	46,297	17,968	2,568	15,256	24,125	16,025	51,039
PAD IV	12,656	8,409	1,443	4,116	2,850	322	834	3,334	440	1,835
PAD I-IV	256,099	194,491	4,073	156,320	34,098	4,618	36,634	92,701	40,521	76,944
PAD V	75,111*	32,680	5,311	20,174	7,195	1,919	6,976	11,874	7,600	24,449
February 22, 1991	331,210*	227,171	9,384	176,494	41,293	6,537	43,610	104,575	48,121	101,393
February 15, 1991§	334,982	229,158	9,654	178,880	40,624	6,185	43,709	105,821	48,847	100,186
February 23, 1990	339,968	245,382	14,880	185,649	44,853	6,323	39,315	116,946	50,296	107,721

*Includes 20,311 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
	Crude oil	Motor gasoline				Jet fuels		Fuel oils		Unfinished oils
		Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	
PAD I	15,175	55,402	51	50,246	5,105	733	10,098	30,727	17,099	10,355
PAD II	70,734	56,416	1,939	47,264	7,213	782	8,901	28,072	3,844	14,350
PAD III	150,791	64,477	619	46,569	17,289	2,280	14,015	25,600	15,030	52,980
PAD IV	12,754	8,180	1,400	3,910	2,870	282	827	3,341	472	1,931
PAD I-IV	259,454	184,475	4,009	147,989	32,477	4,077	33,841	87,740	36,445	79,616
PAD V	75,700*	31,988	4,544	19,308	8,136	1,656	7,005	11,549	8,027	24,552
March 15, 1991	335,154*	216,463	8,553	167,297	40,613	5,733	40,846	99,289	44,472	104,168
March 8, 1991§	330,168	220,134	8,396	170,946	40,292	5,947	41,188	101,547	44,935	103,853
March 16, 1990	350,983	241,159	14,617	182,778	43,764	7,079	39,470	105,894	46,270	109,375

*Includes 20,720 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
	Crude oil	Motor gasoline				Jet fuels		Fuel oils		Unfinished oils
		Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	
PAD I	15,916	56,925	56	51,719	5,150	699	10,290	31,356	17,074	14,137
PAD II	73,116	53,378	1,384	44,690	7,304	846	8,109	29,317	3,763	16,809
PAD III	161,064	57,410	499	41,996	14,915	2,418	12,527	24,844	15,146	53,298
PAD IV	13,592	7,198	1,189	3,594	2,415	310	846	2,992	536	2,494
PAD I-IV.....	263,688	174,911	3,128	141,999	29,784	4,273	31,772	88,509	36,519	86,738
PAD V	78,018*	29,325	4,317	17,794	7,214	1,514	6,629	11,330	7,717	24,986
April 26, 1991	341,706*	204,236	7,445	159,793	36,998	5,787	38,401	99,839	44,236	111,724
April 19, 1991§	337,863	204,904	7,626	160,022	37,256	5,703	37,652	97,218	45,276	110,968
April 27, 1990	372,443	221,011	12,829	168,959	39,423	6,403	42,176	95,920	43,891	107,170

*Includes 17,003 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
Crude oil	Motor gasoline				Blending Comp.†	Jet fuels		Fuel oils		Unfinished oils
	Total	Leaded†	Unleaded†			Naphtha	Kerosine	Distillate	Residual	
PAD I	16,417	59,033	79	53,856	5,098	694	10,687	33,875	16,729	14,637
PAD II	72,958	54,827	1,184	46,576	7,067	935	8,247	29,329	3,958	17,325
PAD III	164,226	58,390	462	42,392	15,536	2,156	12,582	25,240	14,578	53,040
PAD IV	13,196	7,010	1,136	3,759	2,115	294	720	3,067	563	2,345
PAD I-IV	266,797	179,260	2,861	146,583	29,816	4,079	32,236	91,511	35,828	87,347
PAD V	78,131*	30,154	4,337	18,333	7,484	1,715	6,299	10,341	7,172	25,681
May 17, 1991	344,928*	209,414	7,198	164,916	37,300	5,794	38,535	101,852	43,000	113,028
May 10, 1991§	338,717	206,219	7,332	161,344	37,543	5,647	38,637	101,700	44,190	115,089
May 18, 1990	379,708	213,167	11,771	163,750	37,646	6,572	41,068	99,221	43,452	110,360

*Includes 17,302 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
Crude oil	Motor gasoline				Blending Comp.†	Jet fuels		Fuel oils		Unfinished oils
	Total	Leaded†	Unleaded†			Naphtha	Kerosine	Distillate	Residual	
PAD I	16,024	61,516	74	56,817	4,625	678	11,911	41,402	17,207	13,274
PAD II	73,264	52,697	1,349	45,169	6,179	909	9,017	30,852	3,800	18,861
PAD III	174,299	63,451	574	45,156	17,721	2,280	14,430	25,595	15,217	50,009
PAD IV	12,103	6,979	1,099	3,562	2,318	312	783	3,294	539	2,260
PAD I-IV	275,690	184,643	3,096	150,704	30,843	4,179	36,141	101,143	35,763	84,404
PAD V	78,299*	33,336	4,502	20,024	8,810	1,819	6,970	11,937	6,896	25,582
June 21, 1991	353,989*	217,979	7,598	170,728	39,653	5,998	43,111	113,080	43,659	109,986
June 14, 1991§	352,298	218,151	7,592	171,904	38,655	5,819	40,869	111,321	45,658	111,828
June 22, 1990	383,874	216,238	11,576	165,069	39,593	6,774	40,899	109,805	44,382	116,003

*Includes 19,005 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
Crude oil	Motor gasoline				Blending Comp.†	Jet fuels		Fuel oils		Unfinished oils
	Total	Leaded†	Unleaded†			Naphtha	Kerosine	Distillate	Residual	
PAD I	16,876	58,308	45	52,701	5,562	564	10,628	46,874	18,259	13,525
PAD II	70,733	54,472	1,198	46,484	6,790	817	9,304	31,144	4,001	18,434
PAD III	165,143	61,454	545	44,204	16,705	2,168	15,524	28,331	14,992	51,933
PAD IV	11,661	6,333	1,137	3,211	1,985	296	861	2,939	423	2,064
PAD I-IV	264,413	180,567	2,925	146,600	31,042	3,845	36,317	109,288	37,675	85,956
PAD V	82,570*	30,280	4,349	18,718	7,213	1,674	6,727	11,136	6,937	25,122
July 26, 1991	346,983*	210,847	7,274	165,318	38,255	5,519	43,044	120,424	44,612	111,078
July 19, 1991§	348,614	213,852	7,274	167,386	39,192	5,321	42,857	119,021	43,417	111,479
July 27, 1990	386,588	215,554	10,424	165,754	39,376	6,327	44,638	118,613	44,742	112,346

*Includes 22,505 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)										
Crude oil	Motor gasoline				Blending Comp.†	Jet fuels		Fuel oils		Unfinished oils
	Total	Leaded†	Unleaded†			Naphtha	Kerosine	Distillate	Residual	
PAD I	17,510	55,193	40	50,609	4,544	525	10,746	50,725	18,384	13,538
PAD II	70,153	58,210	938	50,420	6,852	930	8,993	31,338	3,960	16,398
PAD III	169,371	60,072	490	43,015	16,567	1,800	15,842	28,520	15,440	53,176
PAD IV	11,645	5,290	751	2,847	1,692	240	776	3,104	450	2,049
PAD I-IV	268,679	178,765	2,219	146,891	29,655	3,495	36,357	113,687	38,234	85,161
PAD V	79,937*	28,816	4,015	17,000	7,801	1,831	5,800	10,960	7,519	24,202
August 23, 1991	348,616*	207,581	5,234	163,891	37,456	5,326	42,157	124,647	45,753	109,363
August 16, 1991§	343,616	205,811	5,556	163,658	35,597	5,604	41,458	123,735	45,542	110,291
August 24, 1990	376,607	210,851	9,925	162,467	38,459	5,958	43,249	124,049	48,273	109,384

*Includes 15,945 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

	Crude oil	(Thousands of barrels)								Unfinished oils
		Motor gasoline				Jet fuels		Fuel oils		
		Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	
PAD I	16,195	58,769	25	53,233	5,511	584	11,890	58,944	21,043	13,066
PAD II	69,212	58,557	988	50,730	6,839	876	9,648	31,907	3,682	17,595
PAD III	166,294	60,080	499	42,913	16,668	1,875	16,200	32,195	14,907	51,959
PAD IV	12,029	5,263	901	2,862	1,500	261	793	2,689	450	2,029
PAD I-IV	263,730	182,669	2,413	149,738	30,518	3,596	38,531	125,735	40,082	84,649
PAD V	75,791*	30,962	4,338	18,614	8,010	1,349	6,912	12,541	8,309	24,663
September 27, 1991	339,521*	213,631	6,751	168,352	38,528	4,945	45,443	138,276	48,391	109,312
September 20, 1991§	334,311	213,306	6,677	168,207	38,422	5,080	44,714	135,678	47,771	109,340
September 28, 1990	354,644	223,892	11,063	172,008	40,821	6,070	42,143	134,807	51,488	113,096

*Includes 15,978 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

	Crude oil	(Thousands of barrels)								Unfinished oils
		Total	Motor gasoline			Jet fuels		Fuel oils		
			Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	
PAD I	16,975	55,127	76	50,458	4,593	351	11,707	62,719	20,450	13,819
PAD II	69,281	54,746	787	47,107	6,852	1,141	9,493	29,678	3,528	16,908
PAD III	171,118	60,541	491	44,413	15,637	1,958	15,517	27,992	13,706	52,477
PAD IV	11,369	5,995	1,072	3,393	1,530	259	847	2,495	453	1,943
PAD I-IV	268,743	176,409	2,426	145,371	28,612	3,709	37,564	122,884	38,137	85,147
PAD V	79,037*	29,285	3,845	17,426	8,014	1,372	6,204	11,918	7,453	25,138
October 25, 1991	347,780*	205,694	6,271	162,797	36,626	5,081	43,768	134,802	45,590	110,285
October 18, 1991§	338,341	211,833	6,548	167,610	37,475	5,220	43,955	135,394	46,332	111,066
October 26, 1990	339,478	220,405	10,752	171,276	38,377	6,364	45,225	138,086	50,180	106,987

*Includes 16,554 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

	Crude oil	Motor gasoline								Jet fuels		Fuel oils		Unfinished oils
		Total	Leaded†	Unleaded†	Blending Comp.† (1,000 bbl.)	Naphtha	Kerosine	Distillate	Residual					
PAD I	15,728	55,957	74	51,590	4,293	409	12,262	64,942	21,916	14,757				
PAD II	72,181	53,505	861	46,138	6,506	840	8,793	30,942	3,962	15,478				
PAD III	169,814	60,215	587	45,279	14,349	1,782	16,562	29,997	14,460	52,124				
PAD IV	10,833	6,526	1,172	3,686	1,668	299	648	2,534	374	2,015				
PAD I-IV	268,556	176,203	2,694	146,693	26,816	3,330	38,265	128,415	40,712	84,374				
PAD V	72,868*	30,340	2,849	19,028	8,463	1,341	5,848	11,638	8,407	24,293				
November 29, 1991	341,424*	206,543	5,543	165,721	35,279	4,671	44,113	140,053	49,119	105,567				
November 22, 1991§	346,870	202,698	5,421	161,969	35,308	4,541	42,657	138,621	48,020	109,279				
November 30, 1990	335,549	221,100	9,728	171,347	40,025	6,533	45,281	132,850	51,202	108,550				

*Includes 17,157 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API CRUDE AND PRODUCT STOCKS

	Crude oil	Motor gasoline				Jet fuels		Fuel oils		Unfinished oils
		Total	Leaded†	Unleaded†	Blending Comp.† (1,000 bbl)	Naphtha	Kerosine	Distillate	Residual	
PAD I.....	15,382	56,912	78	51,985	4,849	549	11,574	64,996	22,861	14,680
PAD II.....	72,458	55,241	717	47,495	7,029	699	8,733	31,348	3,470	14,234
PAD III.....	164,898	63,746	576	47,579	15,591	1,521	15,904	29,756	14,710	49,956
PAD IV.....	11,455	6,707	1,164	3,882	1,661	308	638	2,742	422	1,983
PAD I-IV.....	264,193	182,606	2,535	150,941	29,130	3,077	36,849	128,842	41,463	80,853
PAD V.....	71,617*	32,147	2,537	20,828	8,782	1,351	6,686	11,957	7,873	22,701
December 20, 1991.....	335,810*	214,753	5,072	171,769	37,912	4,428	43,535	140,799	49,336	103,554
December 13, 1991§.....	340,391	214,366	4,970	171,122	38,274	4,583	43,801	142,345	51,157	105,280
December 21, 1990.....	333,979	223,664	10,039	174,929	38,696	6,081	45,223	131,473	49,261	102,083

*Includes 19,049 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	1-25 1991	1-18* 1991	1-25 1991	1-18* 1991	1-25 1991	1-18* 1990
Total motor gasoline.....	161	166	2	3	163	169
Leaded gasoline.....	—	—	—	—	—	—
Unleaded gasoline.....	161	166	2	3	163	169
Mo. gas. blending comp.....	13	155	—	—	13	155
Distillates.....	289	97	11	4	300	101
Residual.....	299	211	12	8	311	219
Jet fuel-naphtha.....	—	44	—	—	—	44
Jet fuel-kerosine.....	50	34	4	4	54	38
LPG.....	79	91	4	2	83	93
Unfinished oils.....	730	298	4	1	734	299
Other.....	113	136	2	1	115	137
Total products.....	1,734	1,232	39	23	1,773	1,255
Canadian crude.....	768	733	—	—	768	737
Other foreign.....	4,446	3,974	153	151	4,599	4,125
Total crude.....	5,214	4,707	153	155	5,367	4,862
Total imports.....	6,948	5,939	192	178	7,140	6,117

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	2-22 1991	2-15* 1991	2-22 1991	2-15* 1991	2-22 1991	2-15* 1990
Total motor gasoline.....	68	61	4	1	72	62
Leaded gasoline.....	—	—	—	—	—	—
Unleaded gasoline.....	68	61	4	1	72	62
Mo. gas. blending comp.....	42	117	—	—	42	117
Distillates.....	145	48	6	2	151	50
Residual.....	408	417	10	10	418	427
Jet fuel-naphtha.....	2	26	—	—	2	26
Jet fuel-kerosine.....	58	29	3	3	61	32
LPG.....	77	85	4	4	81	89
Unfinished oils.....	316	342	3	2	319	344
Other.....	134	252	2	3	136	255
Total products.....	1,250	1,377	32	25	1,282	1,402
Canadian crude.....	673	858	6	19	679	877
Other foreign.....	4,126	5,215	154	83	4,280	5,298
Total crude.....	4,799	6,073	160	102	4,959	6,175
Total imports.....	6,049	7,450	192	127	6,241	7,577

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	3-15 1991	3-8* 1991	3-15 1991	3-8* 1991	3-15 1991	3-8* 1990
Total motor gasoline.....	79	255	1	4	80	259
Leaded gasoline.....	—	—	—	—	—	—
Unleaded gasoline.....	79	255	1	4	80	259
Mo. gas. blending comp.....	—	69	—	—	—	69
Distillates.....	261	236	7	5	268	241
Residual.....	461	330	10	15	471	345
Jet fuel-naphtha.....	2	2	—	—	2	2
Jet fuel-kerosine.....	71	70	4	7	75	77
LPG.....	87	104	2	5	89	109
Unfinished oils.....	182	381	1	3	183	384
Other.....	164	303	2	3	166	306
Total products.....	1,307	1,750	27	42	1,334	1,792
Canadian crude.....	716	743	27	9	743	752
Other foreign.....	4,683	4,294	11	95	4,694	4,389
Total crude.....	5,399	5,037	38	104	5,437	5,141
Total imports.....	6,706	6,787	65	146	6,771	6,933

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	4-26 1991	4-19* 1991	4-26 1991	4-19* 1991	4-26 1991	4-19* 1990
Total motor gasoline.....	354	650	4	8	358	658
Leaded gasoline.....	—	—	—	—	—	—
Unleaded gasoline.....	354	650	4	8	358	658
Mo. gas. blending comp.....	60	10	—	—	60	10
Distillates.....	199	355	1	3	200	358
Residual.....	332	455	10	14	342	469
Jet fuel-naphtha.....	15	—	—	—	15	—
Jet fuel-kerosine.....	76	56	—	3	76	59
LPG.....	140	209	2	1	142	210
Unfinished oils.....	586	59	4	—	590	59
Other.....	399	473	3	3	402	476
Total products.....	2,161	2,267	24	32	2,185	2,299
Canadian crude.....	793	697	—	39	793	736
Other foreign.....	4,409	3,780	200	29	4,609	3,809
Total crude.....	5,202	4,477	200	68	5,402	4,545
Total imports.....	7,363	6,744	224	100	7,587	6,844

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	5-17 1991	5-10* 1991	5-17 1991	5-10* 1991	5-17 1991	5-10* 1990
Total motor gasoline.....	285	441	42	14	327	455
Leaded gasoline.....	—	—	—	—	—	—
Unleaded gasoline.....	285	441	42	14	327	455
Mo. gas. blending comp.....	10	55	—	9	10	64
Distillates.....	26	288	5	1	31	289
Residual.....	422	271	12	35	434	306
Jet fuel-naphtha.....	10	16	—	—	10	16
Jet fuel-kerosine.....	32	93	3	4	35	97
LPG.....	67	95	—	2	67	97
Unfinished oils.....	562	574	2	2	564	576
Other.....	155	255	2	2	157	257
Total products.....	1,569	2,088	66	69	1,635	2,157
Canadian crude.....	631	692	—	6	631	698
Other foreign.....	5,525	5,328	94	187	5,619	5,515
Total crude.....	6,156	6,020	94	193	6,250	6,213
Total imports.....	7,725	8,108	160	262	7,885	8,370

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	6-21 1991	6-14* 1991	6-21 1991	6-14* 1991	6-21 1991	6-14* 1990
Total motor gasoline.....	409	590	10	11	419	601
Leaded gasoline.....	—	—	—	—	—	—
Unleaded gasoline.....	409	590	10	11	419	601
Mo. gas. blending comp.....	145	4	—	—	145	4
Distillates.....	210	285	4	—	214	285
Residual.....	403	315	8	8	411	323
Jet fuel-naphtha.....	8	5	—	—	8	5
Jet fuel-kerosine.....	51	33	5	6	56	39
LPG.....	177	89	12	1	189	90
Unfinished oils.....	221	440	5	9	226	449
Other.....	231	76	—	—	231	76
Total products.....	1,855	1,837	44	35	1,899	1,872
Canadian crude.....	690	762	3	9	693	771
Other foreign.....	5,253	5,168	158	276	5,411	5,444
Total crude.....	5,943	5,930	161	285	6,104	6,215
Total imports.....	7,798	7,767	205	320	8,003	8,087

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	7-26 1991	7-19* 1991	7-26 1991	7-19* 1991	7-26 1991	7-27 1990
Total motor gasoline.....	172	290	9	9	181	299
Leaded gasoline†.....	—	—	—	—	—	—
Unleaded gasoline†.....	172	290	9	9	181	299
Mo. gas. blending comp.....	14	12	—	—	14	12
Distillates.....	102	148	—	—	102	148
Residual.....	325	539	2	62	327	601
Jet fuel-naphtha.....	12	9	—	—	12	9
Jet fuel-kerosine.....	30	27	3	5	33	32
LPG.....	291	179	7	9	298	188
Unfinished oils.....	498	610	8	6	506	616
Other.....	202	131	14	—	216	131
Total products.....	1,646	1,945	43	91	1,689	2,036
Canadian crude.....	716	729	7	—	723	729
Other foreign.....	4,928	5,886	135	254	5,063	6,140
Total crude.....	5,644	6,615	142	254	5,786	6,869
Total imports.....	7,290	8,560	185	345	7,475	8,905

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	8-30 1991	8-23* 1991	8-30 1991	8-23* 1991	8-30 1991	8-31 1990
Total motor gasoline.....	419	485	12	34	431	519
Leaded gasoline†.....	—	—	—	—	—	—
Unleaded gasoline†.....	419	485	12	34	431	519
Mo. gas. blending comp.....	22	20	—	—	22	20
Distillates.....	103	134	1	1	104	135
Residual.....	437	602	10	35	447	637
Jet fuel-naphtha.....	8	9	—	—	8	9
Jet fuel-kerosine.....	29	63	2	12	31	75
LPG.....	141	174	4	5	145	179
Unfinished oils.....	397	486	5	11	402	497
Other.....	206	232	2	3	208	235
Total products.....	1,762	2,205	36	101	1,798	2,306
Canadian crude.....	752	796	19	10	771	806
Other foreign.....	5,248	5,788	363	219	5,611	6,007
Total crude.....	6,000	6,584	382	229	6,382	6,813
Total imports.....	7,762	8,789	418	330	8,180	9,119

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	9-27 1991	9-20* 1991	9-27 1991	9-20* 1991	9-27 1991	9-28 1990
Total motor gasoline.....	180	415	16	15	196	430
Leaded gasoline†.....	—	—	7	—	7	—
Unleaded gasoline†.....	180	415	9	15	189	430
Mo. gas. blending comp.....	3	79	—	—	3	79
Distillates.....	171	484	19	6	190	490
Residual.....	383	643	70	69	453	712
Jet fuel-naphtha.....	7	7	—	—	7	7
Jet fuel-kerosine.....	31	120	1	4	32	124
LPG.....	82	68	1	1	83	69
Unfinished oils.....	383	291	1	6	384	297
Other.....	163	282	11	19	174	301
Total products.....	1,403	2,389	119	120	1,522	2,509
Canadian crude.....	598	612	—	—	598	612
Other foreign.....	6,045	5,440	203	197	6,248	5,637
Total crude.....	6,643	6,052	203	197	6,846	6,249
Total imports.....	8,046	8,441	322	317	8,368	8,758

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	(Thousands of barrels daily)					
	Districts 1-4		District 5		Total U.S.	
	10-25 1991	10-18* 1991	10-25 1991	10-18* 1991	10-25 1991	10-26 1990
Total motor gasoline.....	174	152	7	4	181	156
Leaded gasoline†.....	—	35	—	—	—	35
Unleaded gasoline†.....	174	117	7	4	181	121
Mo. gas. blending comp.....	13	35	—	—	13	35
Distillates.....	211	190	1	1	212	191
Residual.....	298	644	18	44	316	688
Jet fuel-naphtha.....	8	8	—	—	8	8
Jet fuel-kerosine.....	49	27	3	1	52	28
LPG.....	242	307	6	8	248	315
Unfinished oils.....	305	352	—	2	305	354
Other.....	133	98	1	—	134	98
Total products.....	1,433	1,813	36	60	1,469	1,873
Canadian crude.....	437	462	—	—	437	462
Other foreign.....	5,657	4,849	79	144	5,736	4,993
Total crude.....	6,094	5,311	79	144	6,173	5,455
Total imports.....	7,527	7,124	115	204	7,642	7,328

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

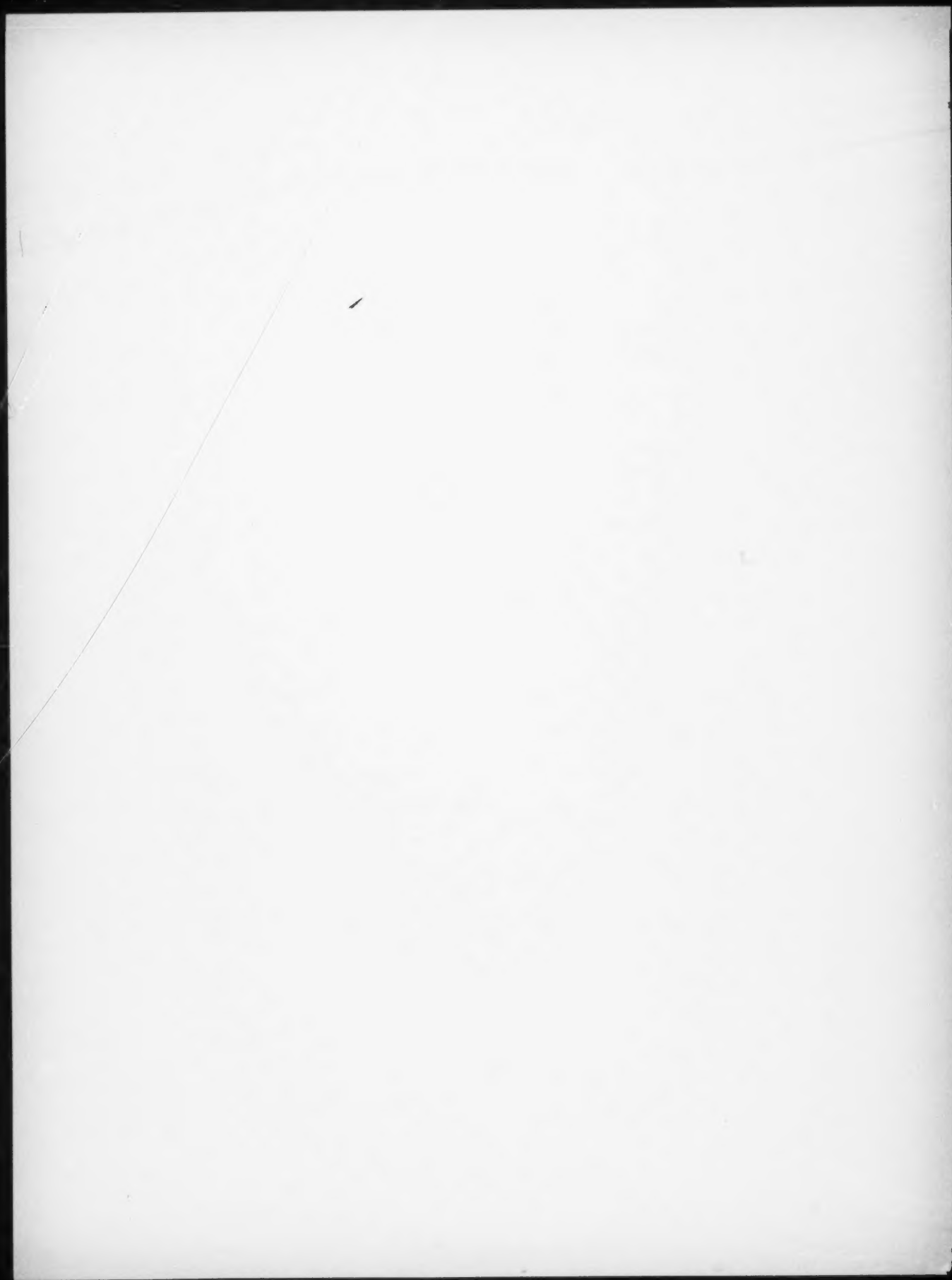
	Districts 1-4		District 5		Total U.S.	
	11-29 1991	11-22* 1991	11-29 1991	11-22* 1991	11-29 1991	11-30 1990
			(1,000 b/d)			
Total motor gasoline.....	265	229	13	9	278	238
Leaded gasoline†.....	—	—	—	—	—	—
Unleaded gasoline†.....	265	229	13	9	278	238
Mo. gas. blending comp.....	26	—	—	—	26	—
Distillates.....	200	265	2	2	202	267
Residual.....	667	560	24	13	691	573
Jet fuel-naphtha.....	8	8	—	—	8	8
Jet fuel-kerosine.....	149	148	5	6	154	154
LPG.....	541	404	2	2	543	406
Unfinished oils.....	553	206	2	1	555	207
Other.....	—	—	—	—	—	—
Total products.....	2,465	1,996	49	34	2,514	1,930
Canadian crude.....	670	861	—	—	670	861
Other foreign.....	3,672	4,586	75	136	3,747	4,722
Total crude.....	4,342	5,447	75	136	4,417	5,583
Total imports.....	6,807	7,343	124	170	6,931	7,513

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

	Districts 1-4		District 5		Total U.S.	
	12-20 1991	12-13* 1991	12-20 1991	12-13* 1991	12-20 1991	12-21 1990
			(1,000 b/d)			
Total motor gasoline.....	211	303	12	15	223	318
Leaded gasoline†.....	—	—	—	—	—	—
Unleaded gasoline†.....	211	303	12	15	223	318
Mo. gas. blending comp.....	19	7	—	—	19	7
Distillates.....	250	366	8	5	258	371
Residual.....	632	435	41	21	673	456
Jet fuel-naphtha.....	8	7	—	—	8	7
Jet fuel-kerosine.....	98	69	5	4	103	73
LPG.....	86	76	6	4	92	80
Unfinished oils.....	399	354	6	5	405	359
Other.....	156	126	—	—	156	126
Total products.....	1,859	1,743	78	54	1,937	1,488
Canadian crude.....	763	690	—	—	763	690
Other foreign.....	4,498	4,880	184	204	4,682	5,084
Total crude.....	5,261	5,570	184	204	5,445	5,828
Total imports.....	7,120	7,313	262	258	7,382	7,098

*Revised. †Included in total motor gasoline. ‡Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.



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